THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE ART OF OBTAINING TENDERS.

THE form of public requests for tenders varies considerably. It is not uninstructive to study these variations and to consider the legal effect of such advertisements. In former days those who invited tenders were wont to do so in some such form as this :—

> The County Council invites tenders for the construction of about 1,000 yards of tramway in certain streets in this district. Plans and specifications may be seen at ———, and copies of the quantities and forms of tender may be obtained at the same place. Sealed tenders must be delivered at ———, by 12 o'clock noon on ———. The Council do not bind themselves to accept the lowest or any tender.

Many changes have been made in this simple form during recent years. For instance, it has become customary to enforce payment of a deposit of from £1 to £5 on receipt of the papers, which deposit is returned on receipt of a *bonâ fide* tender. Sometimes it is stated that with regard to the deposit it "will be forfeited should the contractor not send in a *bonâ fide* tender or afterwards withdraw his tender." In order to obtain a further measure of protection against persons who ask for copies of the paper out of pure curiosity, it is sometimes provided that any tender which is made must remain open for 30 days. One of the most striking features of the latter-day request for tenders is the appearance of the following paragraph :—

> The contractor will be bound to pay to all workmen (except a reasonable number of legally-bound apprentices) wages at rates not less, and to observe hours of labour not greater, than those set out in the Council's list, and such rates of wages and hours of labour will be inserted in and form part of the contract.

The following form is sometimes used :—

> The successful contractor or contractors will be required to employ, to the satisfaction of the surveyor, local labour (if available) in the execution of the works.

Dealing in the first place with the ordinary form, the importance of obtaining copies of the plans and specifications, and of studying them carefully, lies in the fact that mistakes are made that cannot afterwards be rectified. In a recent Scotch case the defender offered to execute work for the pursuers for the lump sum of £859. His offer was accepted. He afterwards found that, owing to an error in calculation made by his son, the offer was £86 less than it would have been. In an action for damages for breach of contract, the defendant having contended that this mistake released him from his contract, the Court held that he was not released (the mistake having arisen through no fault of the pursuers), and that the pursuers were entitled to damages.

Compliance with the provision that a tender must be sent in by a certain time is also essential, as there is no obligation upon the local authority to consider those which come in too late. Time is of the essence of the contract in this respect. The proviso that the Council do not bind themselves to accept the lowest or any tender is in reality mere surplusage, as no

obligation to accept any tender is implied even when the words are omitted. It is, however, a very useful warning to those who are unacquainted with the law. In cases where there is an undertaking to accept the lowest tender, the meaning of this term may have to be considered. It seems that a tender to the effect that, "I offer £100 less than any other builder who makes you a tender," would not be the lowest tender. In South Hetton Coal Co. *v.* Haswell, &c., the owner of certain coal mines proposed to receive sealed tenders from two parties who were competing for the purchase of the mines, and undertook to accept the highest net money tender. One of the competitors offered such a sum as would exceed by £200 the amount offered by the other. It was held that a tender in this form did not answer the description of "the highest net money tender."

The provision that a tender must remain open for 30 days, is of considerable importance, and a contractor should walk warily before he sends in a tender in response to an advertisement which contains this clause. The law is that a tender can be withdrawn at any time before acceptance, and the waiver of this privilege may be a serious matter. Suppose, for example, that a man were to discover on the day after he sent in his tender that he had made a serious mistake. If the advertisement had contained no clause similar to the above, he might withdraw it, and possibly tender anew. The clause which provides that certain rates of wages must be paid, is one which must be carefully watched, and pains must be taken to study the list of wages which is provided by the Council, or the Trade Union rate of wages which is enforced in the district. The provision that local labour must be employed, may also be a pitfall for the unwary.

MUNICIPAL STRABISMUS.

Municipal bodies suffer from a considerable number of ailments, some of which are corrected by local opinion, and some by the astringent action of the Board of Trade. We venture to diagnose a complaint which is by no means new, and which is in very young persons frequently cured by corporal punishment. We refer to strabismus, or the unhappy habit of squinting. It has been said that truth in its beauty can be best beheld by him who has the single eye for its excellence: it is when the view becomes binocular that confusion is apt to ensue.

It is not the first time that we have referred to that unhappy Act of Parliament which, promoted by æsthetic persons, limits the activities of those who wish to advertise. Whether it is in itself a wise Act we are not going to discuss at present, beyond pointing out the fact that two classes of people who are perfectly willing to advance the prosperity of the country are hit by its operations. These are: the electric sign manufacturer who has probably sunk thousands of pounds in what is admitted to be the best advertising medium of the present day, and the large advertiser who is quite willing to spend money on electric signs if he has secured tenure, and if he can get a decent show for his money. Looked at from a commonsense standpoint, it would seem that anything that would help a trading concern to pay larger rates would be hailed with delight by Parliamentary and Municipal bodies, and that advertising would therefore be given every chance. We know differently, however, so we must let that point go.

But there is an anomaly which needs some explanation. It is admitted that municipal bodies have a power to charge a rental for a sign or advertisement projecting more than a certain distance over a roadway. Whether they are wise in exerting that power is another story. And we also know that the electric arc lamp suspended outside a shop front is a most powerful means of drawing attention. We are also aware that not a hundred miles from St. Paul's Cathedral the authorities, far from welcoming this augmentation of street lighting, have, in their wisdom, compelled the placing of screens round such lamps, so that all light except that falling into windows or on the immediate pavement, is blocked. There comes, however, a piece of news from what we have always considered the progressive city of Newcastle-upon-Tyne, which, if correct, seems to indicate an amazing state of complexity in the local by-laws.

We understand that, if an enterprising tradesman in that city wishes to put his name on the globe of the arc lamp outside his shop, he may do so at the rate of about 5s. or 6s. per annum. Apart from the point as to whether a municipality should have powers to charge in this way, it seems a very stringent interpretation of æsthetic ideals, inasmuch as the lettering shuts out no view and does no damage to the passing public. The beauty of the position is heightened when we remember that on arc lamps and globes turned out by more than one prominent firm, and which, we presume, are freely hung in the streets of Newcastle, the name of the manufacturer is prominently displayed. The only logical conclusion to which we can come, if the above facts are correct, is that the powers that be must look with favour on any advertising which is done to benefit a firm outside the municipality, but wish to repress any attempt at advertising which would put a tradesman in the town in a position to pay better rates.

Another interesting feature of the subject, we understand, is that if a massive gold block letter sign is placed outside the premises and on the wall of a business house, the rental charged for this display is quite unimportant; but that if electric lamps are fixed on or recessed into this same sign, the rental immediately rises to a considerable figure. This unsolicited testimonial of the value of electric advertising is rather extraordinary, and might without further explanation be held to indicate a policy of exclusion of the electric sign.

That this is a case of municipal strabismus seems to be confirmed by the consideration that if an electricity supply undertaking were owned by any municipality, it would, in order to justify the existence of an electrical department, have to do its best to sell current wherever possible, and vexatious restrictions would in all probability be removed.

The Bray Explosion.

The letter of Mr. E. A. Wood, published on page 248 of our last issue, reached us too late for comment to be made then, but it shows pretty conclusively that the explanation given in our leader on this matter was fairly correct. Mr. Wood, however, realises that trouble may arise from excess of oil at the cylinder and from excess of cylinder pressure above the blast receiver pressure, and that these faults may occur even with air; that no special excess of oxygen is required. This being so, it is even more necessary that there should be a reflux valve in the air blast pipe in order that there shall be no possibility of back flow or the driving back and spraying of plugs of oil into this large mass of air in the receiver. Nor should it be possible for the cylinder air to get back to the fuel valve, there to cause combustion of the oil at that point. In Mr. Wood's instance the blast air vessel was probably saved by the blowing out of the safety valve bodily before the pres-

sure rose too high in the receiver. Had the receiver contained air richer in oxygen there would not have been time to blow out the safety valve. The pressure would have risen so quickly that the receiver would have burst before the safety valve could move off, so that probably the root cause at Bray was oxygen ; but, all the same, whether oxygen or mere oil excess caused the trouble, both causes may probably be rendered inoperative by the simple mechanical device named. It is possible that the safest form of such a valve is the loosely-hinged flap with restrained opening, and not the mushroom valve. Or a caged ball would probably be fairly certain in automatic closing.

Indian Contract Grievances.

Two letters appear in our "Correspondence" columns this week on a matter of public interest relating to Indian Government contracts. Already it has been ventilated in this journal, but seemingly without the desired effect. It is to be hoped that the present protest will be more successful. The public has the right to demand that its representatives in high places shall act in the interests of the public and not favour private parties without the amplest justification for so doing. It is important that all public contract transactions should be perfectly open and above-board, and it is for the Press, both technical and lay, and for manufacturers and traders, to agitate until some definite action is taken adopting a procedure or policy which shall remove the suspicion which now appears to exist in the minds of some. It is profoundly regrettable when circumstances require a repetition of a complaint of this kind, and it is not calculated to inspire confidence at home in the conduct of public departments in India. Anything in the nature of secrecy is bound to excite curiosity and suspicion, and in connection with public contracting it calls for the strongest possible condemnation. The motives influencing those responsible for placing the contracts may be of the purest, but the best of intentions are of no avail if they be shrouded in mystery. The only correct way is to follow the principle of open tendering and publication of prices and reasons for recommendations when these are not readily apparent. Several years ago we received a complaint that orders for a Japanese Government department did not come home to England because one high official was not aware of the ability and capacity of British electrical manufacturers. In Australia recently the Government of Victoria has put its foot down upon the procedure of sending orders in a certain direction for no other reason than that the habit of so doing has been acquired. It may be that the state of things reported from one part of India is due to prejudice or to habit, and probably some organised action will require to be taken by all the firms interested in the Indian electrical and engineering trade. Naturally enough, for obvious reasons, a single firm, or even two or three, will not care to take isolated action. We trust that the necessity for any further protest will be obviated by a consideration of the whole subject, both by the India Office at home and by those who have authority to give out orders in India.

Railway Companies' Accounts.

As is well known, the accounts of railway companies are in statutory form, and have been published half-yearly since 1868. On January 1st, 1913, however, the Railway Companies' (Accounts and Returns) Act, 1911, which is the result of the recommendations of the Committee appointed by the Board of Trade in 1906, comes into operation. It will probably be remembered that the Committee was not unanimous in its recommendations, Messrs. Ackworth, Paish and Peel being in favour of ton-mile in preference to the existing train-mile statistics, whilst Sir Charles Owens and Messrs. Bailey and Whitelaw were against the introduction of the new element. The former stated that the statistics of ton-mileage and passenger mileage stood, in their judgment, on the same footing as the other accounts and statistics, and should equally be made statutory, whilst the latter urged that the train-mile was a much more trustworthy and constant factor than the ton-mile could possibly be, and that much more exhaustive information in the accounts had been agreed to in order to make the train-mile as accurate as possible in relation to both receipts and expenditure, which alone would involve the companies in very considerable additional expenditure. The ton-mile theory is as interesting as the proposed new car-mile method of calculation for comparative purposes.

There are one or two notable features in the new Act to which we may give brief notice. Under the new law no railway company need prepare or submit to its auditors and shareholders statements of account or balance-sheets, nor hold a general meeting more than once a year except in the case of a company which is under statutory obligation to prepare half-yearly accounts in connection with guarantees of dividend under statutory provisions. The directors may, if it appears to them that the profits of the company are sufficient, declare and pay an interim dividend for the first half-year, notwithstanding the fact that the accounts have not been audited for the half-year and that none have been submitted to the shareholders.

The new Act is likely to mean much additional labour, as the new accounts are greatly increased both in number and volume, and the statistical returns total 24, against the present statutory requirement of 3.

Provision is made in the "Receipts and Expenditure on Capital Account" statement for "electric power stations, &c.," whilst discounts on shares and debenture stocks require to be distinctly recorded.

Electrical Cooking.

Elsewhere in this issue we are able to publish some interesting particulars regarding the working of the Queen's Head Electric Restaurant at Earl's Court Exhibition, the results in connection with which have given satisfaction equally to the caterers and electrical interests concerned.

We take it that the information now published will be amplified at a later date, and that fully detailed test results relating to the various types of apparatus in use will be made available to those engaged in developing the electrical cooking business.

The practicability of electrical cooking is, of course, beyond dispute at the present day—indeed, the fact that as many as 1,700 meals a day are being served in the Queen's Head Restaurant somewhat discounts any criticism on that point. Moreover, we believe that very satisfactory results are being obtained in numerous instances in regard to which nothing is published. A case in point is a Felixstowe hotel, where, under the direction of Mr. Napier Prentice, of the Suffolk Electricity Co., electric cooking on a fairly large scale —with apparatus of Mr. Prentice's own design—has proved very successful from the proprietor's point of view—which, after all, is the main thing.

The successful application of electricity for cooking on a large scale will undoubtedly lead to a wider recognition of its possibilities for domestic purposes. In this direction, however, the problem is a much more difficult and mainly financial one, calling for most skilful handling if it is to be solved.

An interesting development, which we may hope is the beginning of effective co-operation between the manufacturer, central station man, and contractor, for the purpose of pushing the electric cooking and heating business, is contained in the announcement of the General Electric Co., Ltd., to engineer and contractor clients, of its intention to allow consumers a seven-days' free trial of its smaller heating apparatus, such as toasters, kettles, water boilers, flat-irons, &c. Unless the average consumer in this country is extraordinarily different from his American cousin, the free trial arrangement should lead to a greatly extended sale of the smaller class of apparatus, and if the scheme is developed into something of a much more comprehensive character, as we gather is the intention, possibly of the larger apparatus as well. The seductiveness of the free-trial period in one American town, can be gathered from the fact that a 90 days' educational campaign, with from 10 to 30 days' free trial, resulted in over 1,000 irons per month being sold, and comparably good results were obtained in the case of other small apparatus.

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SOME INCONSISTENCIES IN AMERICAN LIGHTING PRACTICE.

By AN ENGLISHMAN IN AMERICA.

At the outset I must utter a word of warning as to the general deductions which may be drawn from a perusal of this short article. I propose to utter a protest against some of the inconsistencies which are to be seen every day in American street lighting; but it must not be inferred from this that I am of the class of Englishmen who can see little in American engineering practice superior to British, and who rate the bulk of American enterprise as froth without the substance. On the contrary, I am a great admirer of the *esprit de corps*, the enthusiasm, and the methods of the members of the American electrical profession; and can assure Englishmen who know little of the American electrical men that they will find in the latter many good points which might profitably be copied in the pursuit of their professional duties at home. At times, however, the fact does forcibly strike one that some of these American schemes, while showing many of the qualities of meritorious performance, possess all the elements of the ridiculous. I propose to name a few instances, and have selected street lighting as the example of American electrical activity to be pilloried.

The Illuminating Engineering Society of America is a flourishing institution, and is doing invaluable work. Its meetings are well attended; and the general calibre of its rank-and-file member is on a high plane as regards technical ability, general intelligence, and practical good sense. The scope of its activities is, I imagine, well understood in England, and reports of its work are received there with probably as much interest as those of the English association in this country. Many of its members would be capable of presenting valuable expert testimony at any conference on subjects such as the conservation of vision, and efficiency of house lighting, and so on; but just now much of the attention of the Society is being devoted to street-lighting matters, and particularly to the subject of ornamental lighting.

About a year ago, a report published by a special committee of the National Electric Light Association, organised for the purpose of studying the question of how much had been done in regard to decorative street lighting, pronounced that there was really nothing in the street-lighting systems of the country which could be called ornamental. As a matter of fact, however, even while the examination was being conducted and the report prepared, considerable activity was being shown on the part of several different manufacturers, both of the lamps and the poles; and these energies were redoubled after the publication of the report. Street standards for tungsten clusters are now to be seen in countless cities in all the States of the Union, some of which are hideous in their over-elaboration, some of which combine a really artistic ornamentation with substantial construction.

Meanwhile, the arc-lamp designers have been busy. The luminous magnetite lamp, the development of which has been directed and fostered by the genius of Steinmetz, provides a beautiful white light of high intensity. The lamp was marketed for a number of years before the ingenuity of the designers succeeded in producing an arrangement of the operating mechanism which would admit of the lamp being mounted on top of a suitable standard for street lighting. The necessary design of lamp was in time produced, while it was a comparatively easy matter to draw up specifications for a simple but ornate standard upon which the lamp might be mounted. The resulting combination provides a unit, of the 4-ampere and the 6·6-ampere rating, probably superior for street-lighting purposes to anything else which has yet been produced, as regards exceptionally high efficiency, low maintenance charges, quality of the light and general appearance, whether by day or night. It is at this point that we may applaud the persistence and the skill of the American manufacturer, who, in this instance, as in nearly all other instances, has proved his ability to produce the goods.

One then logically expects to see the excellent achievement duly crowned and receiving a fit setting as its reward. One sees nothing of the kind, and one's admiration is nearly turned to ridicule. New Haven opens its great White Way, in which this really beautiful lamp is used as the source of light. The papers are full of it; New Haven is *en fête*. The striking of the first arc on its streets is regarded by many as a milestone in the exterior lighting business. It may well be. But how about the setting and the general decorative effect? This is the point: What is the use of evolving a beautiful lighting unit, one of whose main virtues is that it is as pleasing by daylight as at night, when it has to stand, cheek by jowl, with an unsightly wooden pole making an angle of possibly 80° with the thoroughfare, with cross-arms equally ugly and equally off centre, and burdened with lighting and power mains strung with varying sags up and down the street? One of the first things which strikes the Englishman in this country is the manner in which lighting mains and trolley wires are supported, even in the business districts of the cities; and he thanks Heaven that, whatever its faults, the municipality at home is scoring heavily in one direction at least when it insists on trolley cables being hung in a decent manner. In this country the designer performs his full share by facing his problem squarely and designing the required lamp. The advantages which might accrue from his labours are largely thrown away; but the citizens of New Haven are still happy in the delusion that they have beautified their city.

The other matter upon which I wish to touch is the electric advertising sign business, and the general over-illumination of the business districts of a city; taking up the position that it is foolish to provide super-sunlight values on the main street of a town, when the residential quarter, and even the side streets turning out of the main thoroughfares, are illuminated in a manner which, on the score of insufficiency of light, would not be tolerated in an English country town. I have more than once been told the old tale of the Britisher being escorted down Broadway by a New Yorker. His attention was directed to a dazzling sign lit up with many hundreds of 8-c.p. lamps. "Yes, but doesn't it make the thing beastly conspicuous?" I thoroughly appreciate the fact that if an Englishman in America deplores the sign vogue, he will meet with nothing but good-humoured ridicule. But so far I have learnt nothing which will dispose me favourably towards it. There is nearly everything to be said against it, and little in its favour. The weightiest fact against the sign is that it is unsightly—to use no stronger term. Even when carried out on a grand scale, as along Broadway, it represents in its general effect a number of light sources unsymmetrically arranged and distributed, and, therefore, unnatural; carried out on a cheap scale, this unnaturalness is increased and the sparseness accentuated, until the effect is sometimes hideously garish and harsh. If it is these things at night, it is incomparably worse in bright daylight. Another fact against it is that it is (theoretically) a business-getting illumination, and is, therefore, extinguished at an early hour of the night. The regular street illumination is reduced often to a negligible value since the evening illumination is provided by the signs; so that when the signs are cut off the business area is left considerably under-illuminated.

No one will deny that the sign is a business-getter, since abundant figures are forthcoming to prove the assertion. The reservation must be made, however, that it is so only when its use is not general. If there are five restaurants along a street, or five department stores, and one of them erects an attractive sign over its door, it may be assumed that, other things being equal, that store or restaurant will attract more business than any of the others. If—as is usually the case—all the others follow suit, the relative position becomes just the same as it was originally, with the difference that all the stores are paying more money to the central station, and are flooding the street with an objectionable superabundance of light. I do not believe those who argue that the ultimate spending capacity of the whole population is increased. People spend only as much as they have to. If they exceed that rate, the fact can certainly not be taken as a sign of health. The argument that the sign business provides a heavy station load remains in its favour. In most industrial towns, this load comes off the peak, and is therefore a desirable load. But central stations are run by individuals who are citizens first and engineers afterwards; and they may not be disposed to go after a load which,

while putting money in their pockets, is rendering their city an eyesore to the stranger as to the native.

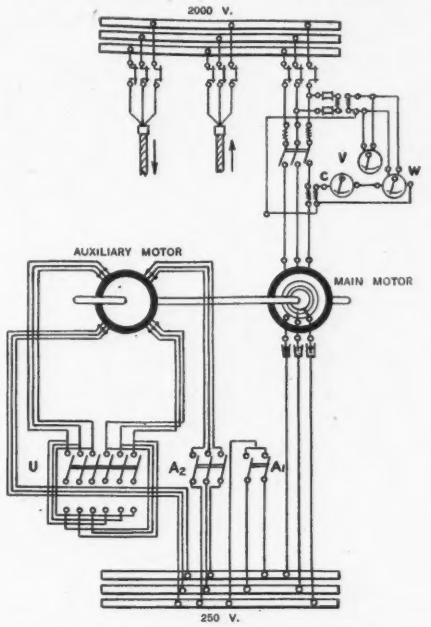
While, however, we may or may not admit the advantages of the sign system, how is it reasonable to cultivate the sign business in the down-town districts, while the illumination of all parts of the cities, except just the business area, is scarcely better than it was 50 years ago? England is way ahead of America in this respect at least; and, in my judgment, it does not matter whether the lighting is done by gas or by electricity. The aim should be the provision of a certain minimum candle-power per square foot at any point on any street, to be obtained by the most efficient illuminant which can be found; and it seems to me absurd that merchants should squander vast sums of money in their attempts to beautify the commercial area ("beautify"=over-illuminate), when their way home of an evening leads them along streets the contour of whose ill-paved sidewalks is revealed to them only on rare occasions. It must, in justice to the American municipality, be said that usually this problem is a difficult one, owing to the fact that many of the streets in the up-town districts in the smaller cities are lined each side with trees, whose function it is to render these streets endurable and beautiful during the blazing midsummer weather. The density of their foliage renders difficult the execution of any efficient scheme for lighting by night. Low-power incandescent lamps at short intervals seem the most hopeful solution. Arc lamps at long intervals are much cheaper, and are therefore adopted, but it is obvious that the system is entirely unsuited to these conditions, and that in such towns it represents nearly a reversion to mediæval conditions of highway lighting.

ADVANTAGES OF THREE-PHASE CASCADE MOTORS.

THE general principle of the Cascade connection of three-phase motors is very well known. Instead of controlling the speed of the main motor by ohmic rotor resistance, the slip energy is efficiently utilised in a second smaller three-phase machine mechanically coupled to the first. If the main motor has p_1 pairs of poles, its synchronous speed, on a supply of f cycles per second, is $(60 . f/p_1)$ R.P.M. and the synchronous speed of the combination of the main machine with an auxiliary motor of p_2 pairs of poles is $(60 . f/(p_1 + p_2))$. As shown below, it is an easy matter to arrange three values of p_2, thus providing four definite speed steps. By using other than a 1 : 1 speed ratio between the main and auxiliary motor shafts, other definite speed steps can be secured, making a total of at least seven without involving an inconvenient equipment.

Various modifications of the simple Cascade connection have been devised to enable continuous speed variation and high power factor. A commutator auxiliary machine is employed, and the energy recovered from the rotor circuit of the main motor may be yielded directly as mechanical energy (Kramer) or indirectly by means of a three-phase D.C. converter on the main motor shaft (Linsenmann), or it may be yielded as electrical energy directly in the Heyland system or indirectly through a three-phase motor-generator, back to the supply network (Scherbius). As shown below, the efficiency of such control systems is very considerably lower than that obtainable by simple Cascade control. The cost of the commutating auxiliary machine is about twice that of the squirrel cage auxiliary used in the system described below, and the operating and maintenance costs are correspondingly higher.

The only justification for the use of the modified Cascade systems—in industrial networks where the lower power-factor of the simple control is not serious—is the continuous-speed control obtained. In many cases this is a most important consideration, but, in other applications, it carries no weight at all. For instance, a colliery fan has to be driven at constant speed for very long periods, with an occasional shut down for an hour or two for inspection and cleaning. The fan is installed when the workings are commenced, and is proportioned to supply ultimately a much greater volume of air than is at first required. For months or years, the fan must be run at reduced speed, its R.P.M. being slightly increased from time to time as the workings expand. Four or seven definite speed steps would admirably meet the requirements; efficient, but not continuous, speed regulation is desirable, and absolute reliability is imperative. The simple cascade system of control fulfills all these desiderata, and the following paragraphs describe the equipment and performance of the Werne Colliery (Osnabruck),* where a fan delivering 11,000 cbm/min. against 300 mm. (water) pressure is driven at 250 R.P.M. by a 1,200-H.P., 24-pole, 50-cycle, slip-ring induction motor coupled through 1 : 1 belting (space forbidding direct mechanical coupling) to a cage-wound auxiliary motor, the stator of which has two windings—one with eight poles, the other with four or two according to connections (see fig. 2). The synchronous speed of



250 r.p.m., A_1 closed; 231 r.p.m. U down; 214 r.p.m., U up; 188 r.p.m., A_2 closed.

FIG. 1.

the main motor is 250 R.P.M., and Cascade speeds of 231, 214 and 188 R.P.M. are available, using the respective connections indicated in fig. 1.

The main motor is connected to the 2,000-volt mains through the necessary measuring instruments. The liquid starter has a split neutral, closed by the switch A_1, and the connection of the main rotor to the auxiliary motor is through the switch A_2 and the reversing switch U). (See also fig. 2.)

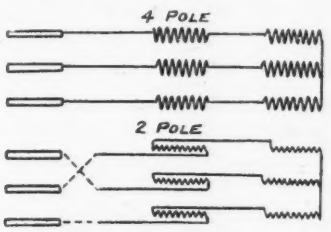


FIG. 2.

It is usual to provide slip rings on the auxiliary motor, and if the present arrangement is adopted the resistance in circuit acts as a primary starter and the auxiliary stator voltage is reduced. If the starter is not switched out at the correct moment (preferably indicated by a tachometer on the motor shaft) there is a danger that the Cascade will not be established, but the additional care required in starting is fully compensated by the elimination of slip rings on the auxiliary machine and the losses and upkeep involved by the latter; (in the present case a phase-wound rotor would need two windings and 12 slip rings, seriously reducing the simplicity and reliability of the installation).

Test Data; Efficiency; Power Factor.—The output and efficiency of the fan and motors, individually, and, as a whole, are shown in fig. 3 herewith, the synchronous speeds of the main motor and of the three cascade steps being marked by broken ordinates. On comparing the efficiency and power factor of the present control system with the corresponding data for other systems and over a range of speed regulation from 8 per cent. to 26 per cent., the following results are obtained :—

System.	Main motor. H.P.	R.P.M.	Speed regulation 8 % and 26 % respectively. Efficiency %.	Power factor %
Present; see fig. 1 ...	1,200	250	94—92	0·75—0·62
Do. with simple slip regulator	1,200	250	89—72	0·89—0·80
Linsenmann, D.C. ...	1,150	270	92—90	1·00—0·98
Heyland frequency changer	950	300	90—84	1·00—0·98
Scherbius, three-phase ...	1,000	363	90—83	1·00—0·98

* See also Glückauf 48, pp. 949-955.

These figures, referring to actual installations, show the marked superiority of the simple over the modified Cascade systems as regards efficiency, and also its marked inferiority as regards power factor.

In general, high power factor is a most important consideration in industrial power supply, but there are cases—the present among them—where the low power factor is of minor importance. The horse-power required to drive a fan varies approximately with the $(\text{speed})^3$, so that, as the speed falls, the current supplied falls below the full speed value, despite the lower power factor of the load; hence larger mains are not required by reason of the low power factor at reduced output. The effect of the latter on the generator capacity required depends upon the extent and nature of the remaining load carried. In the present installation the average

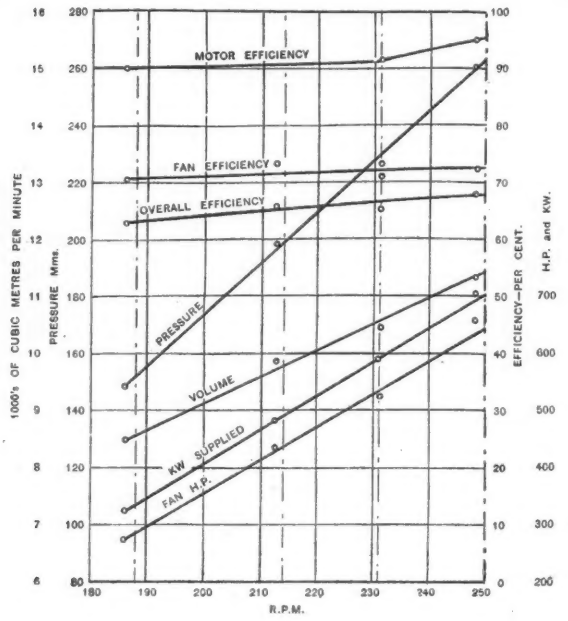


Fig. 3.

day load is 1,800 KW. at a power factor of 0·8. The fan, now running at very low output, requires 323 KW. at 0·57 power factor, and were the power factor of its demand unity, the power factor of the whole installation would average 0·9. The fan load has thus no serious effect on the losses in the mains and the losses in the fan circuit, due to low power factor, are more than offset by the high efficiency of the simple Cascade control. As the output of the fan increases, its power factor and the general advantages of the system employed will increase. There are many other cases in which the use of simple Cascade control offers similar advantages.

WATER-POWER AND LEGAL RIGHTS.

[FROM A LEGAL CORRESPONDENT.]

Although we have not in the United Kingdom a very large amount of power running to waste in streams and canals that might be usefully employed, there are a number of places where the hydro-electric mind finds falls to interest it. The writer, looking at the matter entirely from the legal point of view, desires to consider a few aspects of the question.

It is necessary to consider, in the first place, the legal rights of one who has access to a flowing river. It is manifest that if a man has a river so flowing through his land that he owns the banks on either side, he can use the water as he pleases, subject to the rights of riparian owners lower down. Even if he were to so use the flowing water, that it nearly all passed through his tail race, the lower owners could not object unless the position was complicated by the fact that the water was polluted. Nor would there be the smallest objection in law to the owner above described erecting a dam on his property, which was capable of impounding all the water of the stream. Such water could be applied to any purposes which commended themselves to the landowner. In the nature of things, he would be compelled to provide a by-pass for the release of flood water.

The erection of a dam, and reasonable use of the impounded water, may be complicated by the Acts which have been passed to check the pollution of rivers. When polluted water flows into a dam the matter held in suspension must sink to the bottom. In the result it may become necessary to clean out the dam from time to time. This point is dealt with a little lower down.

It was decided in Miner *v.* Gilmour (12 Moo.P.C. 131) that every riparian proprietor has a right to the reasonable use of the water flowing past his land, for his domestic purposes, and for his cattle, and this without regard to the effect which such use may have, in case of a deficiency, upon proprietors lower down. He has also the right to the use of the water for any other purpose, provided he does not thereby interfere with the rights of other proprietors either above or below him. Upon this authority, a riparian owner would clearly be entitled to use and replace water for the purpose of a mill, but he may also consume a reasonable quantity of water. Thus he may by means of water-wheels and machinery erected by him for that purpose, pump up water from a natural stream flowing past his land to a reservoir, and convey it thence by pipes to his dwelling house. He may even send water to another estate at a distance from the stream, and there apply the water to his domestic and other necessary purposes of utility, provided he takes only a reasonable quantity with reference to the size of the stream and the rights of his neighbour; but he has no right to take more water by means of the wheels and machinery than he would have a right to take otherwise.

Again, a railway company may use water to supply their locomotives. In a case tried some years ago, the Great Northern Railway Co., whose line crossed a stream in the immediate neighbourhood of one of their stations, took water therefrom for supplying their engines and for the general purposes of the station. In an action brought by a millowner lower down the stream, it appeared that the abstraction did no damage in wet weather, and never shortened the working of the mill for more than two or three minutes a day. In these circumstances it was held that the company, as riparian owners, were entitled to take a reasonable quantity of water for their own purposes, and that in this case the quantity was reasonable.

As a general rule, the Rivers Pollution Acts do not apply to or affect the lawful exercise of any rights of compounding or diverting water. The meaning of these words were considered in a recent case (Ribble River Committee *v.* Halliwell, 1899, 2 Q.B. 385). In that case, the owner of a dam was proceeded against for allowing solid matter to enter a stream. For many years prior to the passing of the Rivers Pollution Prevention Act, 1876, he had lawfully exercised the rights of diverting and impounding in a reservoir, water from the stream for the purposes of his business. The water so diverted contained vegetable matter discharged into the stream by paper mills higher up the stream. While the water was impounded, this vegetable matter settled at the bottom of the reservoir, and after two or three days it became putrid. The reservoir was flushed out once a week (on Saturdays after the mill was stopped) by opening sluice gates into the stream and allowing the water from the stream to flow through the reservoir and out again into the stream, carrying with it the putrid deposit at the bottom of the reservoir. The effluent water as it went into the stream contained 97·6 per cent. of water and 2·4 per cent. of solid matter in suspension. In proceedings taken against the mill-owner under Sec. 10 of the Rivers Pollution Prevention Act, 1876, for having, contrary to the provisions of Sec. 2, caused to be put or carried into the stream, so as to pollute its waters, "putrid solid matters," it was held by a majority of the Court of Appeal that, assuming that the matter at the bottom of the reservoir was "solid matter," the mill-owner was not liable to be proceeded against under the Act, for at the time the effluent from the reservoir entered the stream the solid matter was "in suspension in water." It was further held that, assuming that what was put into the stream was "solid matter" within Sec. 2, the mill-owner was protected by Sec. 17 of the Act, which provides that the Act "shall not apply to or affect the lawful exercise of any rights of impounding or diverting water."

In a later case, the proprietors of a dam in order to clean it out turned the whole waters of the river into the dam, while men with spades conveyed the mud and deposit into the current as it flowed through the dam, and by this operation the mud, sludge, and deposit in the dam became admixed with water and were carried in suspension to the outlet from the dam into the river below the mill, rendering the river muddy and turbid for a considerable distance. The effluent, as it went from the dam into the river, consisted of over 99½ per cent. of liquids, and less than ½ per cent. of solids. It was held, on the authority of the Ribble River Committee *v.* Halliwell (*supra*), that the respondents had committed no offence against Sec. 5 of the Act, either in unlawfully causing to be put, or in knowingly permitting to be carried, into the river, the mud sludge and deposit from the dam, as the stuff sent out into the river being in a liquid state, and containing less than ½ per cent. of solid matter, could not then be described as mud, sludge and deposit, and that it was immaterial that it may have been so in the dam before the operation of cleaning began.

These cases make it plain that the owner of a river has but little to fear from the River Pollution Acts if he finds it necessary to impound water for the purpose of generating electricity.

The next question to be considered is: What use, for power purposes, can be made of a navigable river? It was stated in an old case that a navigable river is a public highway, navigable by all her Majesty's subjects in a reasonable manner and for a reasonable

purpose. Being a public highway, all persons have a right to come there in ships, and to unload, moor, and stay there as long as they please; but if they abuse that right, so as to work a private injury (as, for instance, to interrupt the enjoyment of a private fishery), they are liable to an action.

Having regard to this definition, it is clear that a member of the public who has the right to use a navigable river merely as such, could make no use of it for power purposes. For instance, were there a stream in Great Britain having a current of velocity similar to that of the Mississippi, it would not be legitimate to do what they sometimes do in that river, namely, anchor a vessel in mid-stream and use the current to rotate the paddles to drive a floating mill. As to the rights of riparian owners on a navigable river, it has been held that there is no distinction in principle between riparian rights on the banks of navigable or tidal, and on those of non-navigable, rivers. In the former case, however, there must be no interference with the public right of navigation; and in order to give rise to riparian rights, the land must be in actual daily contact with the stream, laterally or vertically.

Assuming that there is no question as to the existence of riparian rights, the question might arise whether the proposed annexation of water for power purposes would interfere with the navigation. In the case of a non-tidal navigable river having no locks, the establishment of a low-level turbine or an ordinary waterwheel might involve a substantial diminution of the volume of water passing along the fairway. In that case, it is apprehended that there might be an interference with the navigation.

The navigable non-tidal rivers, however, are so few in number that the solution of the question regarding them cannot be of any practical importance.

It is next proposed to consider whether and to what extent canal water can be used. Some of the Acts which authorised the making of the canals with which the country is intersected made incidental reference to the use of water for power purposes. For instance, in Blakemore *v.* Glamorgan Canal Co. (2 C.M. & R., 133), it appeared that, by a Canal Act, a company was restricted from any alterations of its canal after the expiration of two years. By the same Act, a proprietor of a mill near the lower part of the canal was entitled to all the surplus water of it. It was held that the erection of a steam engine after the expiration of two years, to pump water into the upper part of the canal, by which the carrying power of the canal was increased and the surplus water diminished by the enlarged trade, was an injury to the millowner for which he was entitled to damages. Where a millowner has the right to use the surplus water of a canal, this means that he is entitled to use all the water which is not for the ordinary purpose of a canal. Thus, where a statute directed that a millowner should be entitled to receive the surplus water by a weir above a certain lock, which the company were bound to keep watertight, it was held that it was to be inferred that the company should not have the right of passing any water through the lock, though necessary to the lower part of the canal, except that which passed when barges were lowered through the lock.

It may be also pointed out in this connection that a company incorporated for the purpose of making and maintaining a canal, and having powers under its Act to take water for the purpose of supplying the canal, cannot by user acquire a prescriptive right to take the water for any other purpose.

Where rights are reserved to millowners as against a canal company the remedy for infringement of those rights is often to be found not in an action at law, but in proceedings for compensation under the compensation clauses. So in Redler *v.* Great Western Railway Co., 96 L.T. 98, a company was authorised by Act of Parliament to construct a canal and cut to be supplied with water from a river, and the proprietors were empowered to do anything "which they shall think requisite and necessary or convenient for .... maintaining and using the said canal and cut .... doing as little damage as may be," and making compensation as provided by the Act. A later Act authorise the construction of a tidal basin and entrances in connection with the canal, and extended the powers conferred by the earlier Act to such additional works. The proprietors of the canal drew water from the river, through the canal, to scour out silt which was deposited in the tidal basin and entrances and tended to choke them, and by so doing interfered with the supply of water to mills situated on the river. It was held that they were justified under the powers contained in the Act in so using the water, and that the remedy of the millowners was under the compensation clauses.

Those who are riparian owners along a canal cannot, of course, assert any right to the use of the water. In fact, for any person to take water without permission would be a trespass, if not something worse.

Canadian Farming.—According to the *Standard*, the Hydro-Electric Power Commission will be able to furnish the individual agriculturist with a constant 2-H.P. service for $24 per year, which will enable him to do his milking, chop his feed, light his farm, and perform many of the house and general farm duties. For heavier work like threshing and ploughing, it is proposed to send about the country motor-wagons, with the assistance of which a cable can be connected with the transmission line at any point, and be tied up to the threshing machine that will turn over 24 acres each day.

INTERNATIONAL ELECTROTECHNICAL COMMISSION.

(*Continued from page* 251.)

THE following is the third instalment of definitions of electrical terms adopted by the British Electrotechnical Committee:—

Note.—Words printed in SMALL CAPITALS are already explained or will be explained later.

Master Controller or Pilot Controller.—A controller used in the MULTIPLE-UNIT SYSTEM of electrification. It does not act directly on the current supplied to the motors, but works electromagnetic or other switches called CONTACTORS. These contactors control the motors.

Maximum-Demand System.—A system for assessing the payment to be made for a supply of electrical energy, composed of two parts: (1) a sum depending on the maximum power supplied during a certain period; and (2) a sum proportional to the energy supplied during that period.

Meg-Mega.—A prefix signifying one million times—*e.g.*, megohm, one million ohms; megavolt, one million volts.

Messenger.—A name used in America for a wire or cable from which electric wires or cables are hung. Called in railway work a CATENARY, in telephone and telegraph work a SUSPENDING WIRE.

Mho.—The unit of CONDUCTANCE. The reciprocal of the OHM. The conductance of a circuit the resistance of which is one ohm.

Micro-.—A prefix signifying one millionth part; *e.g.*, microampere, one millionth of an ampere; microfarad, one millionth of a farad.

Micron.—One millionth of a metre; *i.e.*, one thousandth of a millimetre.

Microphone.—A device employed at the transmitting end of a telephone circuit, consisting of a contact or system of contacts such that the resistance is altered by the impact of the sound waves.

Middle Wire.—The conductor of a THREE-WIRE SYSTEM of supply the potential of which is intermediate between those of the other two. Sometimes called the intermediate or neutral.

Mil.—One thousandth of an inch.

Mil or Circular.—A unit used in America, the area of a circle of which the diameter is one thousandth of an inch.

Milli-.—A prefix signifying one thousandth part; *e.g.*, milliampere, one thousandth of an ampere.

Milker.—A dynamo used for charging individual cells forming a portion of a battery of ACCUMULATORS. Sometimes called MILKING BOOSTER.

Mirror Galvanometer.—A galvanometer having a mirror attached to the moving part. A beam of light reflected from the mirror is used as a pointer, or the image of a scale is observed in the mirror by means of a telescope.

Moment.—(*a*) Of a force. The effectiveness of a force to produce rotation about a point. The product of the magnitude of the force and the length of the perpendicular let fall on its line of action from the point.

(*b*) Of a couple. The product of the magnitude of one of the two equal forces and the arm or perpendicular distance between them.

(*c*) Of a magnet. The product of the strength of one of the poles of a magnet and the distance between them.

Morse Alphabet.—A signalling code in which two different signals, arranged in groups of one or more, are used to represent a letter, figure or symbol.

Motor.—A machine for converting electrical energy into mechanical energy.

Motor Generator.—A machine consisting of a DYNAMO or ALTERNATOR driven by an electric MOTOR, either in the form of two distinct parts coupled together, or having the armature windings on a common core and revolving in a common field. Sometimes called a dynamotor, a term not recommended.

Motor Transformer.—A term not recommended. See TRANSFORMER.

Mouse Mill.—A special continuous-current motor used for running paper strip though a SYPHON recorder.

Moving Coil Instrument.—A measuring instrument, the indication of which depends on the torque exerted by a magnetic field on a coil through which the current to be measured passes.

Multicellular.—Voltmeter or electrometer. An instrument in which several pairs of quadrants act on several NEEDLES mounted on one axis.

Multiphase.—Synonym for POLYPHASE.

Multiple Arc.—Synonym for connection if PARALLEL. A term not recommended.

Multiple Board.—A form of telephone switchboard.

Multiple-Unit System.—A system of electric traction, in which two or more cars are units in themselves and have their own motors, controlled by electromagnetic or other switches called CONTACTORS. When the cars are coupled together as a train, the contactors can all be worked from a single MASTER CONTROLLER.

Multiplex Telegraphy.—A telegraphic system in which several messages, generally more than two, in either direction can be transmitted on one circuit at the same time.

Multipolar Generator or Motor.—A Dynamo, Alternator or Motor having more than one pair of magnetic poles.

Mutual Induction.—See Induction, Mutual.

Needle.—A name originally applied to the moving magnet of a mariner's compass, later to the similar magnet of a galvanometer, and to the paddle-shaped moving conductor of a quadrant electrometer.

Needle Astatic.—See Astatic.

Negative.—Of the two Poles of any source of electricity, that one is called negative which corresponds as far as the direction of the current in the external circuit is concerned, to the zinc plate of a Daniell cell.

Network.—A number of conductors interconnected for the distribution of electrical energy in a supply system.

Neutral.—(*a*) In a Three-Wire System of supply, the Middle Wire is sometimes called the neutral or intermediate.

(*b*) The point of junction of the conductor of a star-connected polyphase system of alternate-current working. See Phase.

(*c*) Points on a dynamo commutator. Those points between which there is a maximum electromotive force when the dynamo is running on open circuit.

Nominal Horse-Power.—An obsolete mode of describing the output of a steam engine in terms of certain of its dimensions.

Non-Inductive.—(*a*) *Circuit.*—A circuit so arranged that its self-induction is practically negligible.

(*b*) *Winding.*—Two identical insulated conductors laid side by side, or twisted together, and so connected that a current traversing them in opposite directions generates no sensible magnetic field.

(*c*) *Load.*—A load such that its self-induction is practically negligible.

Ohm.—(*a*) *True.*—The unit of resistance in the Practical System of units. The value in the c.g.s. system is equal to 109 electromagnetic units.

(*b*) *International.*—The resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice 14·4521 grammes in mass, of a constant cross-sectional area, and of a length of 106·300 cm. (International Conference, 1908, the British Order in Council, January 10th, 1910.)

Ohmmeter.—An instrument for measuring electrical resistance by the deflection of a pointer over a scale.

Oil Transformer.—A Transformer immersed in oil.

Omnibus Bar.—See Bus-bar.

Oscillation, Electric.—When a system or circuit possessing Capacity and Self-induction is disturbed from its condition of electrical equilibrium, the currents flowing alternately in opposite directions with decreasing amplitude during the return to equilibrium are called electric oscillations.

Oscillating Circuit.—A circuit in which electrical Oscillations can freely take place.

Oscillator.—A conductor having effectively both Self-induction and Capacity in which electric Oscillations can be set up.

Oscillograph.—An apparatus for observing or recording quickly varying currents or potential differences.

Outer.—The two conductors of a Three wire System between which there is a maximum voltage are called the outers.

A term not recommended as a synonym for the external conductor of a concentric cable.

Output.—A synonym for Load. The total power delivered at the shaft or at the terminals of a machine or apparatus. See Rated Output.

Over Compounding.—(*a*) of a generator. A generator is said to be over compounded when the potential difference between its terminals increases with the load.

(*b*) of a motor. A motor is said to be over-compounded when the speed increases with the load.

Over-load.—A load greater than the Rated Load.

Over-load Circuit Breaker.—An automatic switch which opens when a predetermined load is exceeded.

Parallel.—(*a*) Two or more systems of conductors are said to be in parallel in a circuit, when the current flowing in the circuit is divided between the two systems.

(*b*) Two or more systems of conductors, generators or motors, are said to be connected in parallel when the terminals of the same sign are electrically connected together.

Paramagnetic.—A substance of which the magnetic permeability is greater than unity (vacuum).

Paste (of an accumulator).—The active material of the plates or grids of an Accumulator. So called, as it is sometimes applied as a moist composition or paste.

Peltier Effect.—The liberation or absorption of heat which takes place in a heterogeneous circuit at the joint where an electric current passes from one material to another.

Period (Periodic Time).—Any varying quantity, which repeats its values regularly at equal time-intervals, is said to be periodic, and the time-interval of one repetition is called the periodic time or period.

Permanent Magnet.—A body, which having been magnetised, retains a substantial portion of its magnetism.

Permeability.—See Magnetic Permeability.

Permeance.—See Magnetic Permeance.

Phase.—(1) (*a*) In an operation which occurs harmonically, the stage or state to which the operation has proceeded.

(*b*) In an operation which recurs harmonically, the fraction of the whole period which has elapsed, measured from some fixed origin.

(*c*) *Phase Difference.*—The difference of phase (usually reckoned in time or in angle) between two periodic quantities which vary harmonically and have the same frequency. See Lag.

(*d*) Each of the circuits of a polyphase apparatus is sometimes called a phase.

Single-phase.—A supply is said to be single-phase when it consists of a single alternating current.

Two-phase.—A supply is said to be two-phase when it consists of two alternating currents which are displaced with regard to one another by one-quarter of a period.

Three-phase.—A supply is said to be three-phase when it consists of three alternating currents displaced with regard to one another by one-third of a period.

Polyphase.—A supply is said to be polyphase when it consists of more than one alternating current displaced with regard to one another by equal periods.

Phase-angle.—The angle between two vectors representing two simple harmonic periodic quantities having the same frequency but differing in phase from one another; *e.g.*, the vectors representing alternating voltage and the current produced by it.

Extended Meaning.—The angle between any two vectors which represent quantities having the same fundamental frequency.

Phasemeter.—Apparatus for measuring the distance of phase between two periodic electric quantities of the same frequency.

Photoelectric Effects.—Any changes in the electrical properties of a body produced by the action of light, *e.g.*, generation of electromotive force, change of resistance, or loss of charge.

Piezoelectric Effect.—The production of electrification by mechanical pressure.

Pile.—(*a*) *Thermo-electric.*—A source of electrical energy due to the direct transformation of heat into electrical energy, generally consisting of a series of thermo-junctions.

(*b*) *Voltaic.*—An obsolete synonym for a Battery of Cells.

Pilot Wire.—(*a*) A wire used for measuring the voltage at a distant part of a Network.

(*b*) In a Multiple Unit System. a wire used between the Master Controller and a Contactor.

Plant.—A collective term including various machines, equipment and apparatus used together for any purpose.

Planté Plates.—Accumulator plates prepared by electrolytic action on lead in acid.

(Process invented by G. Planté.)

Plough.—An appliance for effecting a sliding electrical connection between the conductors of a Conduit System and the electric equipment of a car.

Plug Contact.—A slightly conical or screwed metal plug for making electrical contact between two conductors, conducting bars or blocks, or between the bars or blocks and the plug.

Point (in wiring).—The termination of the wiring for attachment to the fitting for one or more lamps or other consuming devices.

Polarization.—A condition set up in a battery or electrolytic Cell as a result of the passage of a current, and which manifests itself by a back-electromotive force.

Polarity.—A quality of a body, in virtue of which certain characteristic properties are manifested at points called Poles.

Pole.—(*a*) Of a Cell. Synonym for the Terminal or the accessible part of an Electrode.

(*b*) Of a Magnet. Points towards which Lines of Force converge, or at which the resultant Magnetic Force may be considered to act.

(*c*) Of an Arc. The extremity of each of the Electrodes between which the Arc burns.

Pole-Piece.—Any specially shaped piece of magnetic material forming a polar extension, and in the case of a Generator or Motor, facing the Armature.

Poly-phase.—See Phase.

Positive.—Of the two Poles of any source of electricity, that one is called Positive which corresponds, as far as the direction of the current in the external circuit is concerned, to the copper plate of a Daniell cell.

Potential, Difference of.—(*a*) *Electric.* A difference of potential exists between any two points if energy is expended or acquired in moving a unit of electricity from one point to the other. In practice measured by a Voltmeter.

(*b*) *Magnetic.* A difference of potential exists between any two points if energy is expended or acquired in moving a unit magnetic Pole from one point to the other.

Potentiometer.—An instrument for measuring electrical quantities depending in principle on balancing an unknown Difference of Potential against a known fall of potential obtained by the passage of a current through an adjustable resistance.

Power.—The rate of doing work. Units, the Watt, Kilowatt, and Horse-power.

Power-Factor.—The ratio of the Watts to the Volt-amperes.

Practical Units.—Some of the Units of the centimetre-gramme-second or c.g.s. system are inconveniently large or small for practical purposes; and, therefore, certain Practical Units have been chosen, which are made some decimal

multiple or sub-multiple of the corresponding units. Thus, the AMPERE is one-tenth, and the VOLT is 100 million times the C.G.S. unit (electromagnetic) of current, and the C.G.S. unit of ELECTROMOTIVE FORCE respectively.

Pressure.—Often used as a synonym for VOLTAGE, ELECTROMOTIVE FORCE, DIFFERENCE OF POTENTIAL.

Primary.—(*a*) CELL or BATTERY. See CELL, in contradistinction to a SECONDARY BATTERY or an ACCUMULATOR.

(*b*) Of a TRANSFORMER. That winding of a TRANSFORMER to which electrical energy is supplied.

Pull-Off.—See EAR.

Pulsating Current or Pulsatory Current.—A uni-directional current which varies in some periodic or quasi-periodic manner.

Pyro-Electric Effect.—The ELECTROSTATIC CHARGE produced by heating a body (particularly the substance tourmaline).

Pyrometer.—An instrument for measuring temperatures higher than those measurable by an ordinary thermometer.

Quadrant Electrometer.—A measuring instrument consisting of a moving vane or NEEDLE placed within or near four quadrants, the electrostatic forces between the fixed quadrants and the moving NEEDLE producing the deflection.

Quadruplex Telegraphy.—The method in telegraphy in which four messages are sent simultaneously—two in each direction.

Quantity.—(*a*) Of electricity. The product of current into time. Units, COULOMB and AMPERE-HOUR.

(*b*) Obsolete term for the strength of a current as distinguished from the INTENSITY of the battery which furnishes the current.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

The "Armearth" System of Cable Protection.

THE GENERAL ELECTRIC CO., of 67, Queen Victoria Street, E.C., has recently introduced the "Armearth" system of cable protection, consisting of 12-ft. lengths of rolled grooved steel conduit, so designed that when the halves are bolted together they completely enclose the cable. Each length is half overlapped on to the opposite half, to which it is bolted, thus giving a large area of contact, and ensuring electrical continuity and mechanical strength; also the ends overlap 1½ in. The bolts are of special type, with eyes and square nuts, and can be tightened up without special tools; the eyes provide for suspending the conduit, which must be hung on edge. The conduit can be bent round large radius

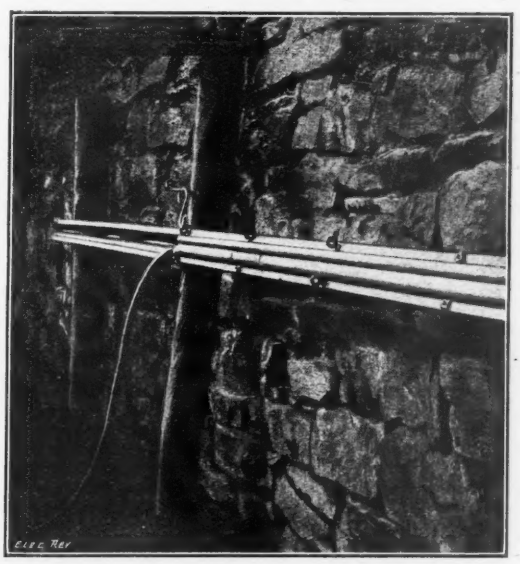


FIG. 1.—"ARMEARTH" CABLE PROTECTION IN A MINE.

curves without trouble, and standard short bends can also be supplied. The "Armearth" system is particularly recommended for mines, as two men can easily erect it, and unarmoured cable can be used with it, saving about 25 per cent. on the cost of armoured cables.

Unarmoured cable is much easier and lighter to handle in the mine, where weight and size are limiting factors in the material used, and the "Armearth" protection is specially adapted for bringing existing unarmoured cable installations into line with the Revised Home Office Rules.

Sternol Oil Testing Machine.

The patents for a machine for testing oil have been acquired by the STERN, SONNEBORN OIL CO., LTD., of Royal London House, Finsbury Square, E.C., where they are willing to demonstrate its operation to readers. The machine is intended to reproduce the conditions obtaining in practice, as regards both pressure and temperature, and records the results on a chart. Provision is made for admitting high-pressure steam, saturated or superheated, up to a temperature of 850° F., into the chamber in which the oil is tested, so that cylinder oils can be tested under working conditions.

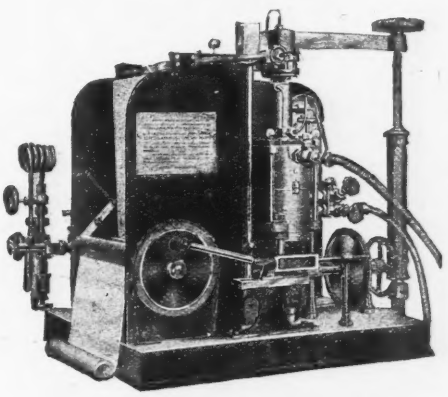


FIG. 2.—STERNOL PATENT OIL-TESTING MACHINE.

The use of curved bearing surfaces has been abandoned in this instrument, on account of the difficulty in maintaining the conditions uniform, and instead the oil is tested between flat disks, which can be so shaped as to represent various types of bearing, and can be revolved at any desired speed, equivalent to relative speeds ranging from 5 to 25 ft. per second, while the pressure forcing them together can be varied from 1 to 750 lb. per sq. in.

The illustration, fig. 2, shows the complete machine from the front. It is stated that the experimental results obtained are not merely comparative, but absolute, and show with precision the merits of each sample, besides indicating the purpose for which it is most suitable.

"Wirum" Lamps.

In the new catalogue of the BRIMSDOWN LAMP WORKS, LTD., referred to last week, there is illustrated the "Wirum" 100-watt lamp, fitted with Canadian screw cap. This lamp is made specially for export purposes, and we illustrate it in fig. 3. In the same

FIG. 3.—"WIRUM" LAMP WITH SCREW CAP.

list the company gives full particulars respecting its special carton for lessening the probability of breakage of filaments in transit. The carton has no lid to be torn off, it has a gripping device at both ends, and there are two elliptical openings, one on either side, opposite each other, so that the filaments can be examined without removing the lamp.

A Submarine Lifting Magnet.

An interesting test has been carried out at the wharf of Messrs. Geo. Cohen & Sons, Regent's Canal Dock, where it was recently decided to recover from the dock alongside the wharf a large quantity of scrap-iron which had fallen in while loading and unloading barges.

Dredgers and divers had been unable to get this material up from the mud, but the difficulty was overcome by installing—on the advice of Mr. F. H. Preece, engineer, of 49, Queen Victoria Street,

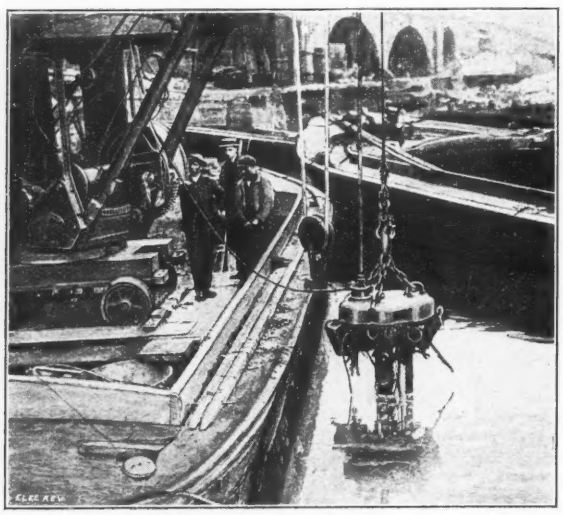


Fig. 4.—Kramer Magnet Recovering Submerged Scrap Iron.

E.C.—a lifting magnet on a barge crane, as shown in the accompanying view, fig. 4, which has proved successful in lifting several tons of material per hour from a depth of 16 ft. of water. The magnet is of the Kramer type, supplied by the Witton-Kramer Electric Hoist Co., of Witton.

The "Klipton" Lamp.

A handy little device (for which patents are pending) is the "Klipton" electric lamp, which Messrs. Rose Bros., of 38, Beech Street, Barbican, E.C., are supplying.

It consists of a small dry battery, which can be placed in any convenient spot, and a length of flexible leading to a small lamp bracket carrying a metal lamp. The lamp bracket, however, is attached to an ordinary spring clip, which can be sprung on to the top or bottom of a book, on to any ledge or bar, near to the place where light is required. It should prove invaluable as an emergency light, which can be clipped to some near-by object, and leaves the user both hands free.

Safety Locks for Automatic Lifts.

Messrs. Smith, Major & Stevens, Ltd., of Abbey Works, Northampton, have introduced a safety lock for lifts, which is claimed to overcome the defects of previous so-called locks of this type, operating with the closing of the gate.

In the new patent lock the gate must first be completely closed, and till that is done nothing more can be effected. Next follows the latching of the gate, which must be completed before current can be given to the machine. Finally, current is given.

On opening the door, current is first cut off; then only can the gate be unlatched and finally opened. The device has also been further strengthened against wilful interference.

WIRELESS TELEGRAPHY AND SEARCHLIGHTS FOR ENSURING SAFETY AT SEA.

The report of the Merchant Shipping Advisory Committee on regulations for ensuring safety of life at sea has been published this week. It contains the following references to matters of interest to our readers :—

"The question of the installation of wireless telegraphic apparatus in merchant vessels has been considered by the Sub-Committee we appointed to deal with this question. Their report is as follows :—

"Having regard to its proved value, we are of opinion, that the time has now come when the State may reasonably prescribe the class or classes of vessels on which a wireless installation shall be compulsory, and the conditions which are to govern its use.

"Before proceeding to set out our recommendations, we think it desirable to review, briefly, the present position from the standpoint of the British shopowner who is prepared, without compulsion, to provide his vessels with radio-telegraphic installations. After passing under consideration the various types of installation which are at present in the market, we have been brought face to face with the fact that practically all British merchant vessels at present fitted with wireless telegraphy use installations under the control of Marconi's Wireless Telegraph Co. A few, but, so far as we can learn, not more than 20, British vessels have been supplied with installations by the Helsby Wireless Telegraph Co., or by Messrs. Siemens Bros., who are the agents for the Telefunken system in this country. On foreign vessels other systems—in particular the Telefunken system—appear to be largely used.

"In order to arrive at an opinion as to the present commercial position, we have taken evidence from Mr. Godfrey Isaacs, the managing director of the Marconi Co., Mr. F. Hird, representing Messrs. Siemens Bros., Lieut.-Col. J. Bernard, chairman of the Helsby Wireless Telegraph Co., and Mr. F. J. Chambers, chief engineer of the same company.

"The evidence makes it clear that the Marconi Co., relying mainly on their Patent No. 7,777, of 1900, and on the extended Lodge Patent No. 11,575, of 1897 (the rights of which they have acquired) claim what amounts to a monopoly in this country.

"This claim is disputed by Messrs. Siemens Bros., and by the Helsby Co., but both of those companies are desirous of obtaining from the Marconi Co. a licence to use the Lodge patent. The Marconi Co. are bound, under the extension of the Lodge patent, 'to grant licences to all who desire to make use of the protected invention, on such terms as a duly qualified arbitrator, to be nominated by the Board of Trade, shall think fair and reasonable'; and on the application of the Helsby Co. the terms upon which such a licence is to be granted are at present the subject of arbitration. But whatever may be the result of these proceedings, the Marconi Co. contend that the Lodge patent cannot be worked effectively without an infringement of their patent No. 7,777.

"The Marconi Co. who have been successful in such patent actions as have been concluded in this country, have, we understand, instituted legal proceedings to prevent the use of the Telefunken system, and in at least one of the actions they have joined as defendants the shipowners who have installed that system. On the other hand, we understand that Messrs. Siemens Brothers have instituted legal proceedings against the Marconi Co. in which they challenge the validity of the patent No. 7,777. We can express no opinion on the matters in dispute, but we have arrived at the conclusion that any British shipowner dealing with the Marconi Co.'s competitors will do so at the risk of costly litigation, and, further, that, as matters stand at present, any effective competition with the Marconi Co. in the supply of installations may be impracticable.

"In considering the present commercial position it must be further borne in mind that so long as the rival patents are held in only a few hands, there is risk of the competitors amalgamating or of pooling their commercial interests so as to obtain, on joint account, the best possible price for all their installations. This risk is emphasised by the fact that whilst the Telefunken system is at war with the Marconi system in this country, they are apparently working as an amalgamated company in Germany.

"It would, in our opinion, be impossible to require, by law, merchant vessels to be fitted with wireless telegraphic apparatus if thereby shipowners were delivered into the hands of a monopoly which could impose such terms as it pleased without stay or hindrance.

"Before Parliament can apply compulsion to any class of ship, it must therefore, in our opinion, first establish the conditions of a free market in the installations, or otherwise ensure their supply to merchant vessels at a reasonable commercial cost and under reasonable commercial conditions. This is a point to which we attach great importance, and the recommendations we are about to make are subject to such an arrangement being arrived at.

"We would, in relation to the questions we have been discussing, again emphasise the point that we have looked at the question of the installation of wireless telegraphy on merchant ships solely from the point of view of saving life.

"This is the only point of view which is relevant to our inquiry and, in our opinion, it is the only consideration which should govern legislative enactments on this subject. Shipowners themselves should be left to deal with the question of the installation of wireless telegraphy for commercial purposes, or for the convenience of passengers; and we fully recognise that in regard to installations for such purposes the wireless telegraphic companies are entitled to obtain from the shipowner the best terms their command of the market will secure to them.

"For the purpose of considering what compulsory requirements should be imposed, we have divided the merchant vessels into three classes :—

"1. Foreign-going vessels carrying passengers.

"2. Home trade vessels carrying passengers.

"3. Vessels not carrying passengers.

"In vessels of the first class, with many people on board, the installation of wireless telegraphy is, in our opinion, a necessity, and we therefore recommend that all foreign-going vessels, British and foreign, carrying passengers from or to the United Kingdom, and having on board 50 persons or more, including both passengers and crew, shall be required to be equipped with radio-telegraphic apparatus.

"With regard to vessels of the second class, another Sub-Committee is considering what requirements may properly be imposed on

home trade vessels carrying passengers, and we feel that the Merchant Shipping Advisory Committee will wish to take into account the report of that Sub-Committee before deciding on the advice to be tendered to the Board of Trade as to the installation of wireless telegraphy on such vessels. We accordingly make no recommendation as to these vessels, subject to what is said below as regards the range of the apparatus and the number of operators to be carried on such of these vessels as shall be required to carry the installations.

"The position of the vessels in the third class which do not carry passengers requires careful consideration.

"Having regard to considerations (stated in the report), we are of opinion that if Parliament, in the interests of the community, compels any of the cargo vessels to carry wireless installations, the owners of such vessels should be reimbursed out of public funds for any expenditure imposed on them by complying with such compulsory requirements.

"If the community are not prepared to bear this expense, then in our opinion compulsion cannot be justly applied to this third class of vessel.

"As regards the range of the installations to be provided, we are of opinion that in the foreign trade an installation capable of a normal range by day of 100 miles oversea will be effective for life-saving purposes.

"The minimum range necessary for the home trade passenger vessels depends very largely upon the locality in which the vessel is trading. We understand that the Post Office have arranged, or are arranging, their stations round the coast of the United Kingdom on the principle that any ship off the coast will be in touch with one of the coast stations if she is fitted with wireless apparatus having a range of 100 miles. In the case of many home trade passenger vessels, which are always by the nature of their trade within easy reach of a coast station, a range of considerably less than 100 miles will be sufficient, and after careful consideration we recommend that home trade passenger vessels, to which wireless telegraphy may be compulsorily applied, should be required to be fitted with an apparatus having a range which is deemed by the Board of Trade to be sufficient having regard to the coast stations available, and the nature of the trade in which the vessel is engaged.

"In our opinion, the space occupied by the installations should not be added in calculating the tonnage for any purpose.

"We are further of opinion that in the case of all vessels compulsorily fitted with wireless telegraphy, the regular installation should be supplemented by some form of energy-transmitting apparatus employing accumulators or dry cells, or some other effective supplementary motive power, and capable of working for not less than four hours after the current supplied by the ship's engines has failed.

"Any compulsory provisions for the installation of wireless apparatus should, in our opinion, be preceded by a comprehensive review by the Post Office of their present system of receiving stations with a view of establishing such stations at every point, whether on the coast or on lightships or in lighthouses, at which they can be most effectively used for the preservation of life at sea. We have been informed that it is the intention of the War Office to abandon the military wireless stations in the Channel Islands, and that the Post Office do not see their way to open a wireless station in the Islands for ship and shore work unless they are guaranteed by the lines whose vessels trade in those waters a certain income. If the carrying of the installations on the passenger ships is to be made compulsory, the policy upon which such a demand was based must be entirely abandoned. The necessary receiving stations must be maintained as a national duty, and without regard to questions of commercial returns.

"At the present time the land stations are instructed, in the event of receiving messages of distress, to communicate at once with the coastguard and lifeboat stations nearest to the place of disaster, and with Lloyd's and the Underwriters' Associations at Liverpool and Glasgow, and, further, to use every other possible method of securing that prompt assistance is rendered to the distressed vessel.

"In order that the time expended in communicating the distress messages received may be reduced to a minimum, we recommend that every possible effort be made to establish, so far as is consistent with efficiency, the land stations at points in immediate touch with the ports from which the most effective assistance can be sent.

"We further hope that all possible steps will be taken to improve the system of land wireless stations in other parts of the world, with special reference to the desirability of providing means for a vessel in distress to communicate with the shore.

"It is in our opinion absolutely essential, in the interests of safety, that there shall be unimpeded intercommunication between ship and ship without regard to the particular system of radio-telegraphy adopted by the two vessels. We understand that, as a matter of fact, a distress message is always accepted, whatever may be the system by which it is transmitted, but the right of free intercommunication in regard to ice, derelicts, and other dangers is so important that we think that it should be placed beyond all doubt, and we hope that the Government will now see their way to adhere to the additional undertaking appended to the International Radio-telegraphic Convention of November, 1906.

"There remains the question of the efficient working of the installations.

"The period during which the installation should be in operation is a matter to which we have given very careful consideration, and we are of opinion that to make wireless telegraphy of the greatest possible use for saving life at sea, arrangements must be made to ensure that no signal of distress or danger within the range of the instrument will be missed.

"We have made inquiry whether it would be possible to dispense with constant attendance at the installation by means of some system of call by signal or bell. Although automatic devices of this kind have been invented, none of them have up to the present time been found reliable in practice, and, pending the introduction of a satisfactory device, we consider it essential that a permanent watch on the installation should be kept.

"We recommend that all foreign-going vessels compelled to be equipped with wireless apparatus should be required to carry one fully qualified operator, and in addition such assistants as will enable a constant watch to be maintained during the absence of the operator. Such assistants must possess sufficient experience to be able to recognise at once a distress or danger signal, but they need not be qualified either to receive or to send messages.

"From the life-saving point of view it is clearly not necessary for any vessel to keep open, throughout the 24 hours, a telegraph office for the receipt of either commercial or private messages, and, therefore, whilst the skilled operator is off duty it would be quite reasonable for the assistant on watch to ignore all but distress or danger calls.

"The qualifications required from a skilled operator are already definitely laid down by the International Regulations.

"In the case of the assistants, we are informed that no great amount of skill is necessary. Their sole duty will be to listen for a distress or danger signal, and, in the event of such a signal being received, to summon the operator to the installation. We are advised that the training required in order to secure the efficient performance of this duty is not considerable, and that it would not be beyond the capacity of any reasonably intelligent member of the ship's company. In this connection it has been suggested, and we think the suggestion a good one, that training ships and schools for the Mercantile Marine should be encouraged to give a preliminary training in wireless telegraphy to the boys under their charge, so as to fit them to discharge the duties of an assistant to the skilled operator.

"In the case of home trade passenger vessels, we do not think that assistants will be necessary.

"Finally, it should, in our opinion, be impressed upon all concerned that the operator should be under the captain's control, and that every message transmitted and received by the operator (other than private messages to or from passengers sent whilst the installation is being worked under the captain's orders for the sending of such messages) should be transmitted and received under the control of the captain."

The extent to which wireless telegraphy should be compulsorily fitted in home trade passenger vessels is dealt with by the Home Trade Passenger Vessels Sub-Committee, and the recommendations made by the majority of that Sub-Committee on this question have been adopted by the General Committee, as under:—

"4. *Wireless Telegraphy and Submarine Signalling.*

"Among those most competent to judge and who have had actual experience of its working, there is a strong belief in the usefulness of wireless telegraphy as a means of life-saving. Several owners engaged in the cross-channel trade have already adopted wireless telegraphy and its use is gradually being extended to other companies. Its general adoption, however, is hindered by the present want of suitable shore stations and by the cost of the apparatus. There is practically no revenue from passengers' messages to set against the outlay, and the installation must be regarded as exclusively for life-saving purposes. Another matter which militates against the extension of the system is that, under present regulations, the wireless cabin is added to the net measurement of the ship, on which port dues have to be paid. As these vessels when on service incur dues in two ports, at least, every 24 hours, this means a considerable extra tax for carrying a wireless installation. Submarine signalling apparatus seems, so far as the Sub-Committee can discover, to be used only by one or two fleets. It is will spoken of by those using it, but is still largely in the experimental stage."

In regard to searchlights, the Committee say that they have considered the question of the provision and use of these in large passenger vessels, and, in arriving at their conclusions, they have had the assistance of information supplied by the Admiralty.

"It is possible that a searchlight would be of value in certain circumstances—for instance, in picking up an unlighted buoy, rock, land, iceberg or icefield, in passing through a canal, or for salvage purposes.

"On the other hand, the use of searchlights would be attended by many disadvantages, such as the following:—

"1. Dazzling the observers on board the ship making use of the lights, especially if the lights are badly placed.

"2. General danger to navigation owing to the blinding effect on those on board other vessels and to the possibility of the navigation lights of the vessel exhibiting the searchlight being obscured.

"3. Temptation to make land, buoys, &c., by placing too much reliance on picking up the marks by means of the searchlight.

"4. False security when in the vicinity of ice or other dangers.

"5. The danger of searchlights being mistaken for powerful electric lights from lighthouses, especially in thick or hazy weather, and of searchlights having the effect of screening shore lights from passing vessels.

"The disadvantages of searchlights seem to us so greatly to outweigh their advantages that their adoption in the mercantile marine would, in our opinion, be most inadvisable."

A reservation by Mr. Trevisa Clarke is appended to the report. He mentions, among other things, that "improved means for lifting and lowering a full complement of boats (the majority being in protected positions) by means of electric cranes placed inboard and by a single wire fall and bridle, the cranes being actuated by a

special electric generating plant with independent internal combustion engines, situated at the highest available point above the water line (this plant would also be available for lighting and wireless telegraphy), are fully illustrated in plans and explanatory statements," which he sent to the secretary.

The plans, &c., illustrating this proposal are to be placed before the Special Committee.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Re Contracts in India.

I wrote with reference to the above subject in 1910, and you were good enough to publish my letter in your issue of April 22nd of that year. More than two years have elapsed since then, but the method of placing contracts by the Electrical Department of the Government of Bombay has gone from bad to worse, and as one instance of many, I will cite the contract for the illumination of Bombay in honour of His Majesty the King's visit. This contract was placed without any tenders whatever being called for, and the value of this alone was Rs.1,20,000 (£8,000), while inquiries as "Please let us have your lowest quotation for three metal-filament lamps, one batten holder and one flat-type switch," the total cost of which amounts to only a few rupees (more than the value of which is spent in stationery and postage), are sent round to all firms. Why this should be done when, in contracts amounting to lakhs of rupees, no tenders are called for, and the contracts are simply placed with any firm the Department chooses to select, without, apparently, any reference being made to Government, is surely strange. All have to pay heavy taxes and have the right to make a bid, and tenders should be called for through the medium of the public Press, and the results published, as is done by other Government Departments, municipalities and Native States.

As this matter concerns the electrical department only, I think it is one the Institution of Electrical Engineers, as a body, should take up and inquire into closely, as I feel certain the Civils and Mechanicals would never permit such a scandal to continue to the detriment of their professional dignity.

Thanking you in anticipation of your giving this question the greatest publicity.

One Interested.

Bombay, *August 3rd*, 1912.

A year or two ago a letter appeared in your journal drawing attention to the method adopted of giving out electrical contracts of the Bombay Government; since then matters have become worse, and now all electrical works for the Bombay Government are given to one firm in Bombay without tenders being invited from other well-known electrical firms. As this is not only unfair to the public paying Government taxes, but is liable to lead to corrupt practices, I would ask the assistance of your paper in the matter.

You may make such use of this letter as you think fit.

N. M. Marshall.

Bombay, *August 3rd*, 1912.

The Propulsion of Ships.

Referring to the leading article on the "Propulsion of Ships" in your last issue, I would beg to point out that among the advantages of the electro-mechanical system are the following:—

1. The prime motive power can be distributed in three, four, or—if need be—a dozen parts of the vessel; consequently, better and more convenient disposition of weight than in a steam-propelled vessel can be obtained; and in the case of warships vulnerability is reduced.

2. Avoidance of large and untried sizes of internal combustion engines, with no loss of fuel economy. Up to 500 or even 1,000 H.P. these engines are reliable; above 2,000 H.P. they do not at present inspire the sense of reliability essential in a warship.

3. No complication in coupling engines to screws.

4. Handling of propelling power, including reversing and alteration of speed, can be under immediate control of bridge, almost as simply as a tramcar is controlled by the motorman.

I called the Admiralty's attention to the foregoing two years ago, and was informed that these advantages were well known to it, so let us hope they will soon be materialised.

Francis K. Cassels.

Eastbourne, *August 19th*, 1912.

HOUSE LIGHTING BY STORAGE BATTERIES.

By H. R. TAUNTON.

SOME little time ago there appeared a note in the technical Press anent an experiment in house lighting by means of portable storage batteries in the "West Side Home of a Chicago Citizen." Two 6-volt batteries were in use, each of 60 ampere-hour capacity. One supplied current, we were told, for 14 6-volt metal lamps of from 2 to 10 C.P. Assuming an average of 6 C.P. each, and that, taking one hour with another, half this brilliant illumination would be alight during lighting hours, it is clear that the battery would need recharging at the end of about 8½ hours' use—a long winter's night. Moreover, this remarkable battery was called upon to work a gas lighter, and "burglar alarms, call bells, electric fans and electric cigar-lighters"! To calculate how long the "juice" would last while running a 12-in. fan, lighting cigars, and alarming burglars with a blaze of 2-C.P. lamps, were too far beyond the decimal point for any but a Yankee electrician. He, nothing daunted by the technical difficulties of the problem, gives the answer as a month. "One or other of the batteries is recharged once a fortnight at a cost of 15 cents." It sounds cheap until one works it out at something like 1s. 9d. per unit consumed. Over here we would think that rather expensive; but then a unit evidently doesn't hustle so far in England as it does in Chicago!

The other battery had a no less strenuous existence. It worked a vacuum cleaner, a sewing machine, a massage vibrator, and a table fountain—all at 7½d. a month. We are not told what happens while the battery is round at the station being recharged. Presumably they have to miss massaging or the table fountain, or, perhaps, they switch on to the other battery. But that would be sheer cruelty—unless, maybe, they cut out the 2-C.P. electrolier in the banqueting hall.

There are certain conflicting improbabilities in the report as it reached us, which makes it suspect. The best way to look at it is as an intelligent and stimulating anticipation of possible developments in the near future. Three factors only are necessary in order to make such a scheme of lighting practical: lamps of high efficiency, low charging rates, and accumulators with a high ratio of capacity to weight. The first we have: the 1 watt per candle of a 25-volt metal lamp is good enough for the present purpose. As for the second, most undertakings could well afford to charge batteries as a day load at three farthings, or a penny a unit. Take, for instance, a small provincial station, with a large number of small private residences within a 5-mile radius—too far and too scattered to make it worth while to run mains to them. These might want anything from 20 to 50 lights—full-blooded 16's and 25's, not 2 C.P.'s, such as satisfy the Chicago "West Sider." They would not think of undertaking the expense and trouble of putting down and running their own plant, so perforce they have to be content with oil or candles. But if they could hire accumulators of 120 to 500 ampere-hour capacity, and have them periodically recharged, they would not grudge even the statutory maximum of 8d. a unit, including hire of battery; a figure which would allow a margin of at least 7d. a unit for interest, depreciation and working expenses. Alternatively, of course,

and perhaps preferably, an annual charge could be made for battery hire, additional to the flat rate per unit.

The third factor—a suitable battery—appears at first sight unattainable. The ordinary lead accumulator is too heavy and too messy to be easily handled. Assuming a minimum practical voltage of 25, 14 cells would be required. Open glass boxes would be out of the question, and lead-lined wood boxes of the smallest capacity mentioned above—120 ampere-hours—would weigh something like 60 lb. per cell, or 7½ cwt. for the complete battery, which would occupy about 8 cb. ft. of space. To transport such a mass to and from the station at short intervals would hardly be a practical proposition; and it would be out of the question where a battery of, say, 300 ampere-hours was concerned.

We are not, however, limited to the ordinary type of accumulator, which, as in the example above cited, has only a capacity of from 4 to 6 watt-hours per lb. in the small sizes under consideration. There are cells on the market which will give up to 15 watt-hours per lb. at best, and can give, say, 10 watt-hours per lb. without difficulty. Such cells have been brought to a high state of efficiency in connection with ignition and motor-car lighting. The Edison cell, too, is sufficiently a commercial fact to be worth consideration, and its ratio of capacity to weight is, if anything, higher than that of the best lead cells. The high-efficiency lead cell, however, will do all that we now require of it, and although its life is necessarily short, its low first cost gives it an advantage as compared with the present high price of the Edison cell.

We can then count on the use of a lightly-built lead cell giving 10 watt-hours per pound. Let us take a typical case: a small country house, five miles from a provincial town, and installed with, say, 20 25-watt, 25-volt lamps. In practice, it would only be very occasionally that more than a third of these would be alight at once, and the average proportion in use continuously would be considerably less. It would be safe to calculate that during the eight-hour evenings of midwinter 800 watt-hours would be the maximum consumption. A battery then of about 3,000 watt-hours capacity would require recharging twice a week in winter, and about twice a month in summer.

This, at 25 volts, would mean a battery of 14 cells of 120 ampere-hours' capacity, weighing little more than 2½ cwt. High efficiency batteries are usually mounted in celluloid. or ebonite boxes, and are sealed. There would consequently be no splashing of acid. They are considerably smaller than the ordinary type, and this particular battery, mounted and connected up in a light teak crate, would not occupy more than about 1¼ cb. ft.

It would certainly not be a difficult matter to transport such a battery. It might, for instance, be mounted on a small trolley, well sprung and running on rubber-tired castor wheels, like a porter's truck. It could thus be hauled by one man to and from the station, or several could be attached as trailers to a horse or motor-vehicle, which would be necessary, in any case, for the larger sizes.

Whatever means of transport were adopted, each battery would have its own wheeled trolley, on which it would permanently remain. On the trolley, too, might be fixed a suitable switchboard. This need not comprise more than an ammeter, voltmeter, a pair of tubular cut-outs, and a four-way battery switch—one side only, which would be used for charging at the station and discharging at the house. A pair of flexible leads would complete the outfit.

On arrival at the house, the battery on its trolley would be wheeled into any convenient out-house, shed or lean-to, where the company's meter and cut-outs would be fixed, with a pair of terminals to which the flexible leads could be readily connected. The same man or vehicle that brought the battery would, of course, remove the discharged battery, which would be taken back to the station.

It would obviously be needful to have two batteries to each installation, to ensure continuity of service. If there were a number of installations having the same size battery, a less proportion would suffice, so long as there were always sufficient fully-charged batteries at the station to meet the possible demand.

A difficulty, of course, would be to ensure that a charged battery would be requisitioned at least a day before the one in use was fully discharged, otherwise the life of the batteries, short as it is, would be considerably reduced. The difficulty is not insuperable. An obvious basis for some precautionary regulation or device is the fact that the last stop of the battery switch would not be needed until the battery was near the end of its tether.

From the practical standpoint, then, such a scheme is at least feasible. The only question is, would it pay? Take as a test case the example cited above: a house requiring a 120-ampere-hour battery.

Depreciation at 20 per cent. per annum on two batteries (the maximum proportion) costing, say, £14 each	£5	12	0
Depreciation at 5 per cent. per annum on trolleys and switchboards, costing, say, £7 10s. each ...	0	15	0
Interest at 5 per cent. per annum, on, say, £43 ...	2	3	0
Labourer's time transporting battery to and from station—average, say, two hours a week, or a total of 104 hours at 8d.	3	9	4
Charging cost, 750 units, at, say, ¾d.	2	6	10
	£14	6	2
Consumer pays for, say, 500 units at 8d.	£16	13	4

This shows a profit of about ¾d. a unit, after allowing for a fair interest on the capital outlay. The profit on larger sizes would be approximately *pro rata*, and where there were a number of batteries in use it would be greater.

Of course, 8d. a unit is a heavy price to pay, and a small country house might be able to get the light cheaper by installing, for instance, a small petrol-electric plant. But the present scheme is suggested for the thousands who are unable or unwilling to face the necessary initial outlay of putting down an independent plant, yet would cheerfully meet a fairly heavy annual outlay, if thereby they could discard their ancestral candlesticks in favour of the luxury of electric light.

If the figures quoted will stand the test of experience, there is no reason why a scheme on these lines should not be initiated by provincial supply companies for the benefit of householders beyond the limits of their mains, to the improvement of their stagnant day loads. There is no need to await the advent of the ideal cell. Naturally, however, every improvement in the capacity and cheapness of accumulators will simplify the problem. The day may yet come when the "juice-man" will hang the daily battery on the garden gate beside the matutinal milkcan.

ARTIFICIAL GRAPHITE AND ELECTROLYTIC PROCESSES.

By FRANCIS H. DAVIES, A.M.I.E.E.

In the Electrical Review of July 15th, 1910, the writer gave some particulars of the manner in which artificial graphite is produced in the electric furnace at the works of the International Acheson Graphite Co., of Niagara. Without going into the details of the process, it may be mentioned here that anthracite coal containing a fairly high percentage of ash is the raw material. This is treated in large electric resistance furnaces of 2,000-kw. capacity at a temperature of approximately 7,000° F., and the graphite thus formed is then ground and variously treated to suit it for the numerous useful purposes it fulfills. As was mentioned in the previous article, a large proportion of the output is used for lubricating purposes, paint making, dry battery filling, &c., but there is another important and growing sphere for artificial graphite in the manufacture of electrodes and other articles used in electrolytic processes. For many purposes graphite electrodes of this class have been found superior to crude retort and manufactured amorphous carbons. In the manufacture of chlorine and caustic alkilies, the chlorination of gold ores, the electrolytic decomposition of chloride solutions and the recovery of nickel, zinc, &c., graphite anodes have been found to possess a life of from two to four times that of crude retort carbons and from four to seven times that of amorphous carbons made

from mixtures of pitch, powdered coke, lampblack, &c. In other processes, such as the deposition of metals from sulphate solutions, the oxidation of chromic acid solutions and the manufacture of chlorates, in all of which the anode is exposed to greater oxidising action, the difference in the longevity of graphite and amorphous carbon is not so great, but it is still very appreciable and in favour of the former.

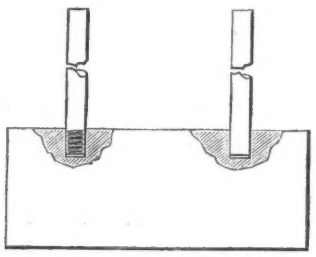


Fig. 1.—Slab Electrode with Graphite Leading-in Rods.

An objection to the use of graphite electrodes in certain industries lies in the colouring of the solution. Owing to this effect, they are not employed in connection with gold or silver electro-plating in cyanide solutions where it is necessary that the plated surface should be clearly visible during the operation. This difficulty, however, does not arise in the ordinary course of electrolytic processes, and the sphere for graphite electrodes is, therefore, a large one, as in many respects they possess undoubted advantages.

An important feature of the artificial graphite electrode which makes for economy in several directions is the ease with which this substance may be worked and machined. In consequence, it is possible to effect considerable saving, not only in actual materials, but by a convenience of arrangement which is not feasible with electrodes of a type that do not possess this quality. A class of electrode which exemplifies one of the principal advantages claimed for the graphite article is shown in fig. 1. Electrical connection with the electrode or slab is made by means of any desired number of graphite leading-in rods which may be either screwed or driven in as shown. The first method is rendered possible by the ease with which artificial graphite takes a thread, differing greatly in this respect from amorphous carbon. Where the rod is driven in it is given a slight taper and made to fit tightly. There is a particular advantage in this arrangement in the case of electrolytic cells from which it is desired to collect gases, and which must, therefore, be kept effectively sealed. Connection can conveniently only be made to the ordinary slab anode by casting around it a head of suitable non-corroding metal, or, as an alternative, by allowing the end of the slab to project through the cover of the cell. Common to both these methods is the disadvantage that the electrode area above the surface of the electrolyte is wasted, and in the latter case there is also the difficulty of making the joint gas-tight. The cast lug is comparatively expensive, and it is furthermore apt to develop a faulty state of contact owing to the effect of corrosion at the joint. In an electrode of the type shown in fig. 1, the maximum use per unit of surface is made of the slab, and when it is worn out the leading-in rods may be used over again. There is no difficulty in making a gas-tight joint round circular rods of small diameter, and no deterioration of contact; thus, none of the objections to the simple slab electrode are present. With the ordinary electric furnace electrode, there is considerable waste owing to the difficulty of using up the stubs. This source of loss, however, does not exist where the artificial graphite electrode is in use, as owing to the ease and cheapness with which it may be machined, short pieces can be jointed in the manner shown in fig. 2. The stub having been used up as near as possible to the metal holder, the latter is taken off, the stub screwed into the tapped end of a new electrode (the shoulders being faced to make a tight fit), and the metal holder affixed to the latter as shown. It is preferred to use a tapered thread, as this is found to be the strongest form with graphite. The brass collar which actually grips the thread, is also tapered externally, and to this the clamp or holder is attached. By a modification of the above method, continuous feeding and joining up of the electrodes can be arranged for, thus obviating the necessity for shutting down the furnace for renewal. It is found that an 8-in. diameter electrode of this type will carry over 5,000 amperes without heating at the joints, and in the case of 6-in. electrodes, 4,500 amperes and even higher currents give no trouble in this respect. This point is of material importance as it is generally assumed that a 6-in. amorphous carbon electrode should not be loaded to a greater extent than 1,500 amperes. Turning to the question of cost: according to the makers the inclusive cost of machining both ends of a 6-in. electrode is about 50 cents, and in the case of an 8-in. electrode 60 cents. These figures cover labour, cost of tool steel, and repairs.

In machining, about 3 in. of the length is lost, and the value of this is put at 59 cents. for a 6-in. and 97 cents for an 8-in. electrode. The total cost for a joint under American conditions is, therefore, $1.09 and $1.57 for the 6 in. and 8-in. sizes, representing 11·5 per cent. and 10 per cent. respectively of the cost of the electrodes themselves in 48-in. lengths. Owing to its higher conductivity the weight of an artificial graphite electrode suitable for any given current is rather less than half that of the amorphous carbon article, but as its price is higher the net result is an approximately equal cost. It is claimed, however, for the graphite electrode that it possesses a much longer life, and there is in addition the possibility of effecting appreciable economy by utilising the short ends.

An interesting example of the use of artificial graphite electrodes is that of the well-known Acker process in which a fused electrolyte and a fused lead cathode are used in the production of chlorine and caustic soda. The form of the graphite anode is shown in fig. 3. The lower face of the bottom block which is grooved to allow the gases to escape is the actual operative part of the electrode, and carries a working current of 2,250 amperes. There are several of these blocks side by side in each cell, and two graphite rods 5 in. in diameter are screwed into each, and act as leading-in rods from the metal cap. This latter is of cast-iron screwed on to the top of the rods and connected by

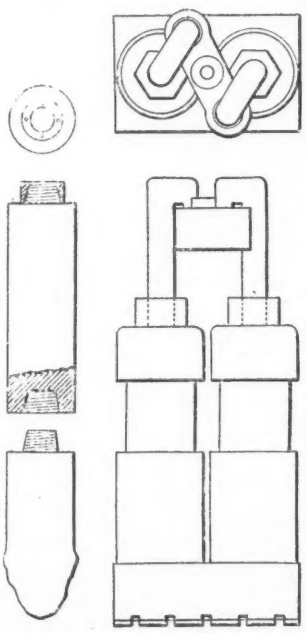


Fig. 2.—Electrode Joint.

Fig. 3.—Electrode for Acker Process.

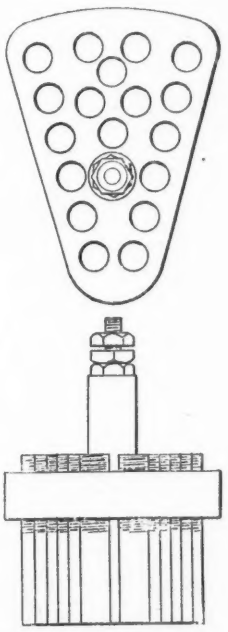


Fig. 4.—Electrode for Rhodin Process.

brass bars which form the terminal. To protect them from oxidation the graphite rods are encased in tile pipes as shown, and the space between the latter and the cast-iron cap is made air-tight by cementing with a suitable fireclay mixture.

In the Rhodin process special graphite anodes of the form shown in fig. 4 are used. This electrode consists of a tri-

angular graphite block, which, fitting the anode comparatively tightly, acts as a cover. A number of 1¼-in. graphite rods are screwed into the block, and by this arrangement they may be lowered as their ends become disintegrated. It is to the use of artificial graphite electrodes of high conductivity that Mr. Rhodin attributes the possibility of passing a current of 800-1,000 amperes through a cell of only 3 ft. diameter, as is done in his process. The high conductivity of artificial graphite (four times that of ordinary carbon) is an important point, but it is not the only one that tells in its favour for electrolytic work. Its adaptability, arising from the fact that it can be readily machined, is obviously a good feature, and, in addition, its high degree of purity and resistance to oxidising and disintegrating action are particularly important. It appears to be very largely used in America for electrochemical processes, and to some extent in Great Britain and Europe.

BUSINESS NOTES.

Dissolutions and Liquidations.—The Bridgwater Construction Co., Ltd., 453, Holloway Road, N., electrical, &c., engineers.—A meeting of the creditors and shareholders of this company was held last week at the Board of Trade Offices, Carey Street, Lincoln's Inn, W.C. The winding-up order was made on April 17th upon a creditor's petition, and accounts had been lodged showing unsecured debts, £983; preferential claims, £89; and loans on debenture bonds, £1,291; making a total indebtedness of £2,363. The assets are valued at £454, and the accounts, with the contributories, disclose a deficiency of £3,159. Mr. W. J. Warley, Official Receiver, reports that the company, which is stated to have been promoted by Mr. Samuel Bridgwater and Miss Florence Bridgwater, was incorporated as a private company on May 26th, 1909, with a nominal capital of £1,250, divided into shares of £1 each; its objects were to acquire and carry on the business of constructional, electrical and hydraulic engineers and ironfounders, formerly carried on by Miss Bridgwater at 453, Holloway Road, N. By an agreement dated June 15th, 1909, the company agreed to purchase from Miss Bridgwater (1) all the plant, machinery, stock, fixtures and chattels at 453, Holloway Road; (2) all existing contracts, subject to liabilities affecting the same; and (3) the goodwill of the business. The consideration, therefore, was £2,498, to be satisfied by the allotment to the vendor of 1,248 fully-paid shares of £1 each, and 25 debentures of £50 each. The shares and debentures were allotted on July 7th, 1909. Mr. Bridgwater states that the working capital was obtained from amounts received from time to time on the company's contracts and from the realisation of certain book debts taken over from the vendor. No accounts were prepared showing the results of the past trading of the vendor's business. Mr. Bridgwater states that the purchase price of £2,498 was based on a valuation made by himself, but he has been unable to produce such valuation. A list of the plant, machinery, fixtures, &c., prepared at the date of the sale amounting to £1,675, has been produced; the balance of £823 is stated to have been the value of the goodwill and lease, the whole of which has been written off. No auditors were appointed, and no accounts showing the company's position were ever prepared, but according to the deficiency account a trading profit of £5,041 had been made from the date of the company's formation to the date of the appointment of the Receiver for the debenture-holder. The company was not, however, able to meet its liabilities owing, it is stated, to its capital being locked-up in contracts in course of completion. Several judgments were obtained against the company by creditors, and in April last, owing to execution being levied on its premises, Miss Bridgwater commenced a debenture action, and on April 16th the Court appointed Mr. R. F. W. Fincham, chartered accountant, of 3, Warwick Court, Holborn, W.C., Receiver for the debenture-holder. The Receiver reports that he is now completing the contracts in hand and realising the assets, but he does not anticipate that any surplus will accrue for the benefit of the unsecured creditors. The failure of the company is attributed by Samuel Bridgwater to insufficient working capital to carry out the contracts in hand, and to pressure by creditors.

Sylverlyte (1909), Ltd.—Creditors must send particulars of their debts, &c., to Mr. F. P. Baxter, 13, Sise Lane, E.C., the liquidator, by September 25th.

Worsley & Page, Ltd.—A meeting of creditors is to be held on August 23rd (to-day) at the office of the liquidator, Mr. A. S. Brewis, 36, Spring Gardens, Manchester.

By way of correction of a notice which appeared in our last issue respecting the firm of Digby & Biggs, we have to state that Mr. Arthur C. Heap was never a partner in that firm, but on the dissolution of partnership between Messrs. C. W. V. Biggs and W. Pollard Digby, Mr. Heap joined the latter, and the business will, as stated, be carried on by these two gentlemen jointly, under the style of Heap & Digby.

Meter Approved.—The B. of T. has approved of the Mordey-Fricker A.C. single-phase two-wire energy meter, A.C.E. type, deposited by the Mordey-Fricker Electricity Meter Co., Ltd.

Engineering Exhibition.—The International Engineering and Machinery Exhibition, to open at Olympia on October 4th, is being organised by the Machine Tool and Engineering Association, Ltd, and it will, as far as possible, follow the idea of a large engineering workshop. Among the exhibitors will be Messrs. Vickers, Ltd., Messrs. Alfred Herbert, Ltd., and Messrs. Tangyes, Ltd.

Bankruptcy Proceedings.—John William Garsden (trading as J. W. Garsden & Co.), electrical engineer, 24, Preston New Road, Blackburn.—The following are creditors herein:—

Baldwin	£15	"Bankers"	£332
The Beaton Metal Co.	32	Maudsleys, Ltd.	25
The D.P. Battery Co.	26	National Gas Engine Co.	102
Edison & Swan	104	Pollard, James, Ltd	37
United Electric Co.	20	Pulvo Co.	16
Gorse, A. D.	58	Simpson, Mrs. Annie	1,183
Glover, W. T., & Co.	60	Sutton, C. A., & Co.	122
Mackintosh, C., & Co.	41	Sterling Telephone Co.	45

Thomas Parker, engineer, 66, Friar Stile Road, Richmond, late 44, Mortlake Road, Kew Gardens, Surrey.—The adjourned public examination of the above-named debtor was held at the Court House, Wandsworth, last week. The examination was adjourned.

W. F. Flint, electrical engineer, Hull.—First and final dividend, 2s. 10d. in the £, payable August 26th at offices of Buckley and Hall, Union and Smith's Bank Chambers, Silver Street, Hull.

Book Notices.—"National Insurance Questions and their Answers." By Gilbert Stone, B.A., LL.B. London: Butterworth & Co. 1s. net.—The author has succeeded in making a both interesting and instructive book, which we can imagine proving of service to both employers and employés. The author has endeavoured to explain many points in regard to this very complicated piece of legislation by taking a host of hypothetical questions so framed as to make them, and the answers made thereto, of general application and use. The several divisions in Part I, each of which has a number of sections, are as follows:—(A) Insured persons; (B) Duties; (C) Contributions; (D) Benefits; (E) Special classes of persons; (F) Miscellaneous points. Part II is devoted to Unemployment Insurance.

"Electric Lighting." By W. S. Franklin. London: Macmillan and Co., Ltd. 1912. Price 10s. 6d. net.

"*Journal* of the Western Society of Engineers." Vol. XVII, No. 6. June, 1912. Chicago: The Society. Price 50 cents.

"Iron and Steel Institute: Charter, Bye-laws and List of Members." London: The Institute. 1912. Price 1s.

"*Journal* of the American Society of Mechanical Engineers." August, 1912. New York: The Society. Price 35 cents.

"*Economic Protection of India-Rubber.*" Paris: Bureau de Reseignements du Brésil a Paris, 59, rue de Richelieu. Gratis.—This is a pamphlet, of 48 pp., containing a translation into English of the law recently passed by the Brazilian Parliament on the economic protection of india-rubber and of the regulation of public administration in respect thereto. Particulars will be found herein of the advantages offered to all who interest themselves in the cultivation of india-rubber, or in kindred industries, in Brazil. At the end of the pamphlet there is a list of instruments and materials destined for use in the rubber industry, &c., that are exempted from importation duties.

New "Wotan" Lamp.—Messrs. Siemens Brothers Dynamo Works, Ltd., of Dalston, are manufacturing, and have placed on the market, an entirely new grade of "Wotan" lamp, suitable for burning in series or parallel, and supplied in voltages from 90-130, and consuming only 7 watts giving 5 c.p. The great filament strength has been retained, and the filament is so thin that it is described as microscopic.

Southport Exhibition.—It is proposed to hold an Electrical Exhibition at Southport, from October 3rd to 12th, in the Cambridge Hall. We are asked to state that there are two or three spaces to let. Particulars may be had from the secretary, Mr. Albert Maund, 13, Corporation Street.

Free Trial Scheme for Electric Cooking Apparatus.—The General Electric Co., Ltd., which has been engaged in the manufacture of electric heating and cooking appliances for the past 18 years, has now made arrangements by means of which contractors and central station engineers can give their customers a seven-day free trial of G.E.C. electric kettles, breakfast cookers, toasters, water boilers and electric flat-irons. Suitable leaflets have been prepared describing the scheme and allowing space for printing the name of the actual contractor, or supply station, and special trial terms are allowed for any orders placed in connection with the free trial offer. Full particulars can be obtained on application to the company.

Trade Announcements.—Owing to increased business, Messrs. W. H. Willcox & Co., Ltd., have taken a building adjoining their main warehouses, 32, 34 and 36, Southwark Street, viz., 38, and are removing there on August 27th. Their registered offices will in future be at 38.

The Midland Electric Manufacturing Co., Ltd., announce that Messrs. Downes & Davies, of 1-3, Stanley Street, Liverpool, have ceased to represent them in Lancashire and Yorkshire. Until further representation in the district has been arranged, all orders should be directed to the head office at Stafford Works, Rea Street South, Birmingham.

Messrs. J. C. Fuller & Son, Ltd., of Wick Lane, Old Ford Road, Bow, E., announce the reorganisation of their works and the laying out of new forming and assembling shops to cope with the increasing demand for their patent Block accumulators for automobile, railway and lighting service.

For Sale.—The buildings, machinery, plant and goodwill of the business of Messrs. Connolly Bros., Ltd., Blackley, Manchester, are offered for sale by tender as a going concern. See our advertisement pages in this issue.

Aluminium Prices in 1913.—It is stated that the International Aluminium Syndicate has now fixed the sale price for the opening of business for 1913 on the basis of 80 marks per cwt. (£80 per ton), with the usual extras for certain sizes and qualities. At the same time only a portion of the output for next year is to be offered for sale at first, as the opinion prevails in interested circles that the production will scarcely be able to satisfy the greatly increasing consumption. Nevertheless, it is asserted that moderation has been observed in the fixing of prices, in order not to hamper the large development taking place in the industries which work up aluminium into highly-finished articles.

Prices Advance.—Owing to the continued increase in the price of raw materials, the British Prometheus Co., Ltd., announce to the trade an increase of 10 per cent. in their trade prices from September 1st next.

Turret Clocks.—The Silent Electric Clock Co. are erecting four large turret dials for the Hovis Bread Co. on their new mills at Vauxhall Bridge. Each dial is 9 ft. 6 in. diameter.

Private Arrangements.—Nathaniel John Kethro Holder, electrical engineer, trading as Price & Co., 21, Shooter's Hill, Cowes, Isle of Wight.—A circular has been issued to the creditors herein by Mr. W. C. Black, I.A., of High Street, Newport, Isle of Wight, which states that the debtor suspended payment on the 7th inst. With the concurrence of the principal trade creditors, Mr. Black has prepared a statement of the debtor's affairs, which shows unsecured liabilities of £116, all of which are due to trade creditors. There is a deficiency of £89. It appears that the debtor started trading in November, 1911, at 16, High Street, Newport, and 21, Shooter's Hill, Cowes, in partnership with a Mr. S. H. Douglas. The latter had previously traded alone. No inventory was made of the assets taken over by the partnership. The business was continued up to May of the present year, when a dissolution took place by mutual consent. Mr. Douglas then retired, and the debtor took over the assets and agreed to discharge the liabilities. No accounts were prepared when the partnership was dissolved. Early last month the debtor sold his Newport business to a man who had previously been in his employ. The sale price of the business was £29, of which £15 15s. represented arrears of wages. The balance of the purchase price was used in paying creditors. A deed of assignment has been executed, to which creditors are asked to assent.

Manufacturing in Canada.—A company established at St. Catherine's, Ontario, with a capital of $1,000,000 (about £205,500), has been incorporated under a Dominion charter, with a view to extending its operations of manufacturing electric motors, dynamos, transformers, switches, &c., as well as to manufacture and deal in all kinds of metal.—*Board of Trade Journal.*

Catalogues and Lists.—The Fahnestock Electric Co., 129, Patchen Avenue, Brooklyn, N.Y.—Catalogue illustrating and pricing the Fahnestock spring-binding post for batteries, telegraph, signal, and other electrical work.

Messrs. Ross & Co., 62, Robertson Street, Glasgow.—Two new catalogues. One of 32 pp. gives wholesale prices of "Rosa" pocket lamps, torches, hand lamps, induction coils, and many other novelties and specialities. The other list (84 pp.) contains illustrations and prices of a variety of electric bells, telephones and accessories therefor.

The National Time Recorder Co., 5, Blackfriars Road, London, E.C.—20-page catalogue giving full particulars, with illustrations, of their time recorders and the purposes for which they are being employed in offices, works, &c.

Messrs. W. T. Glover & Co., Ltd., Trafford Park, Manchester.—Pamphlet illustrating and describing their Whipcord braided flexible cables for mines and workshops, and showing them in use in a large ordnance factory.

The St. Helens Cable and Rubber Co., Ltd., Warrington.—30-page pamphlet, with a serviceable cover, containing a copy of the new rules concerning electricity in mines, as published in March last by the Home Office, together with the company's own condensed version of same. A page of useful cable notes is also given. Copies will be forwarded to any interested reader on application.

Messrs. Brolt, Ltd., Princip Street, Birmingham.—Catalogue of 20 pages containing a fully illustrated description of their Brolt dynamo set for motor-car lighting.

Electrochemical Schemes in Norway.—A scheme is being promoted at Christiania for the formation of a company to work a new process for the extraction of nitrogen from the atmosphere. The share capital is stated, on the one hand, to be £549,000, whilst, on the other, it is assumed that it will be much greater, having regard to the circumstance that the undertaking, according to Mr. Eyde, will be of large dimensions if it is brought to a successful issue. The process relates to the utilisation of the method devised by Herr Serpek, which has been tested on a small scale in France. An application has been made to the Government of Norway by R. Blackstad for a concession to use the water-power of the Aura and the lakes formed by the latter in the north of the Gudbrandsdal Mountains. The available power ranges from a minimum of 197,000 H.P. to a maximum of 230,000 H.P., and would be used for electrochemical purposes, the total expenditure being estimated at £2,800,000.

Consular Notes.—Spain.—The British Consul at Barcelona reports that a Marconi station has been put up near the mouth of the River Llobregat, which flows into the sea about 5 miles to the west of Barcelona. The station is situated between the mouth of the river and the village of Prat de Llobregat, which is some 5 miles inland. Another station has also been put up at Soller, a small town in the Island of Mallorca. The tariff is, for messages between towns in the Peninsula, 4·50 pesetas per 10 words and 45 centimos for each additional word, and the same from the Peninsula to the Canary Islands and the Balearic Islands, or *vice versa*. For messages sent from ships: from Spanish vessels, 7·50 pesetas per 10 words and 75 centimos for each additional word; from ships of other nationalities, 8·50 francs for the first 10 words and 85 centimos for each additional word. In both cases (Spanish vessels as well as foreign) the appropriate charge for the use of any of the landlines is additional. A Marconigram from the Peninsula or the Balearic Islands to New York costs 11·38 francs per 10 words, as against 16 francs by cable, thus effecting a saving of 4·62 francs on every 10 words. From the Canary Islands to New York the cost is 19·18 francs per 10 words, as against 22 francs by cable, or a saving of 2·82 francs on every 10 words. A station was also being erected at Alicante, in the Consular district of Barcelona.

United States.—The British Consul at Chicago reports that that town is one of the leading markets in the United States for electrical goods and supplies. In 1911 the estimated value of these goods manufactured in Chicago amounted to about £10,000,000, an increase of 5 per cent. over 1910. An even greater output is predicted for 1912, as the largest factory has increased its capacity, and several eastern houses also report good advance sales, as well as those in the great west served by Chicago. The feature of the year was an increased number of customers with a decrease in volume per customer. The decrease in the large volume was due to the general industrial depression and lack of inclination to invest capital in new plants. This depression, however, was much less severely felt in Chicago, it is stated, than in the Eastern States. The increase in small orders was due to the installation of electrical apparatus by small business houses and industries, and by large builders. Reports indicate a steady increase in the western business and further prospective advances in that in the south-west and south-east territory.

France.—The British Consul at Lyons reports that the most important development in the electro-metallurgical industry in his district during 1911 related to the production of aluminium and its by-products, the French manufacturers of which have formed themselves into a company called L'Aluminium Francais, with a share and debenture capital amounting to 17,000,000 fr. (£680,000). The most interesting part of the combination lies in the fact that the new company has acquired the exclusive rights all over the world in the Serpek process of aluminium manufacture, hitherto vested in the Nitride Co. (Société des Nitrures), who had in 1910 bought up the rights and plant (at Mulhausen) of the Swiss holders of the patent and had established experimental works in the valley of the Arc, near St. Jean de Maurienne.

Large works utilising 40,000 H.P. are about to be established by the Aluminium combine for the purpose of manufacturing under this process. The alumina thus obtained will be used by the various aluminium works grouped together in the new organisation, and it is intended to carry on the production of the metal on a larger scale than ever, and to extend its use by all possible means. The company is also said to contemplate the erection of rolling and drawing works near Chambéry. It is calculated that, given sufficient water-power, the cost of the manufacture of alumina will be reduced, thanks to the valuable by-product of sulphate of ammonia, from 200 fr. to 50 fr. per ton, a net saving of 150 fr. per ton, or 300 fr. per ton of aluminium.

The Consul understands that the United States rights have been conceded to a subsidiary company with large financial resources, and that licences will probably be granted by the parent company for working the patent in other foreign countries. The production of ferro-alloys and patent steels in the electric furnace grows apace in this district, there now being 12 factories engaged in this branch of the industry. The well-known works at Ugines (Savoie) for working the Paul Girod processes of producing electric steels of great resistance have lately turned their attention to armaments, and have supplied shells to the French and Russian navies.

The output of the various products of the electro-chemical industry grows yearly—the chief articles produced being carbide of calcium, carborundum, chlorates, explosives, phosphorus and sodium. The Nitrogene Co. with works at Briancon, is still experimenting with the manufacture of nitric acid by the Pauling electrical process, which consists of direct oxidisation by means of electric discharges.

Porto Rico.—The British Consul in Porto Rico reports that the concession held by the West India and Panama Telegraph Co. expires during the coming year, and will not be renewed, as the Government wishes to encourage competition in the service. As an immediate consequence the following rates have been reduced:—Havana, from 2s. 6d. to 1s. 10½d. per word; Canada, Nova Scotia, and New Brunswick, from 3s. 1½d. to 2s. 4d.; New York and Brooklyn, from 3s. 1½d. to 2s. 1d.; U.S.A. East of Mississippi, from 3s. 1½d. to 2s. 2½d.; West of Mississippi, from 3s. 4½d. to 2s. 5½d. and 2s. 7d. The rate to the United Kingdom, France, Germany, Holland, and Belgium, remains at 4s. 2d., as heretofore.

China.—The British Vice-Consul at Changsha reports that the electric light works, after many delays, at length began working on June 2nd, of 1911, the current for the first fortnight being supplied free of charge, and thereafter at the rate of 10 c. (about

2½d.) per unit. It can hardly be pronounced a success, only some 3,000 points in all having been installed; the light is poor, breakdowns are of frequent occurrence, and the management is wasteful and extravagant. Enterprises conducted in this manner can hardly compete seriously with kerosene oil, which it is the avowed aim of the company to do.

The British Vice-Consul at Hangchow reports that electric light has at last made its appearance in the city, but the plant is not capable of supplying light to more than a comparatively small portion of the city.

LIGHTING and POWER NOTES.

Aberdare.—A L.G.B. inquiry was held on August 14th respecting the application of the U.D.C. for a loan of £12,000 for the extension of the electricity undertaking. There was no opposition.

Acton.—Mr. S. Lord, accountant to the U.D.C., in his seventh annual report and abstract of accounts, issued this week, says that the electricity undertaking was, under the provisions of the Metropolitan Electric Supply Co. (Acton District) Act, 1911, transferred to the Metropolitan Electric Supply Co., Ltd., as from April 1st, 1911. As several financial matters connected with the transfer are still awaiting settlement, the accounts presented are in the nature of "suspense accounts." Under this heading items of expenditure total £5,773, represented by wages and materials, mortgage debt, and amounts written off as irrecoverable. The income shows that the actual cash received from the company during the year was £3,894. Bank interest and amounts standing to the Council's credit on sundry accounts left a balance, at March 31st, of £829. The balance-sheet shows total liabilities £60,750. Assets and outlay include £54,973, the transfer of capital assets (suspense) account, cash in hands of treasurer, £4,947, and the balance of £829 in revenue (suspense) account. A sum of £2,500 received from the company as part consideration money for the transfer of the undertaking was credited to the district fund during the year.

Afghanistan.—News from Kabul states that the estimates and plans for the electrical installation at Jabal Siraj, north-east of the capital, have been prepared, and the work is to be begun immediately. Water power will be used, and 400 Afghan sappers and miners are to be employed in making the necessary channel. Four stations will be built between Kabul and the head works. The project is in charge of Mr. Jewett, who has received instructions to carry out the works.

Argentina.—The Municipality of Florencio Varela (Buenos Ayres) have accepted the tender of Sr. Ramiro Giostro for an electric light station for public and private lighting. The cost of the station is to be $250,000. Public lighting is to be by means of 10-ampere lamps, at a cost of $26 per month; private lighting 40 cents per KW., and power 25 cents.

The Municipality of Curuzu Cuatia (Corrientes) has signed a contract with Mr. Iturriaga for the erection of an electric light station.

The Comisión de Fomento of Vera (Santa Fe) have applied to Government for permission to call for tenders for an electric light station.—*Review of the River Plate.*

Ashton-under-Lyne.—The electrical engineer to the Corporation has been authorised to arrange for the conversion from gas to electric light of 50 lamps in the principal streets.

An agreement has been entered into between the Corporation and Messrs. John Hill & Son, Ltd., for the supply of electrical energy.

Australia.—Under the New South Wales Industrial Act, a large number of Boards have been appointed to deal with disputes. Board No. 6 has to do with makers, fitters, repairers, and installers of electrical apparatus and installations, and persons employed in the maintenance of electrical apparatus and installations or in running electrical plant, excepting those in the employment of the Chief Commissioner for Railways and Tramways, the Metropolitan Board of Water Supply and Sewerage, the Hunter River District Board of Water Supply and Sewerage, those working electrical coal-cutting machines in coal mines.

Bolivia.—According to the local Press, Senor Juan M. Canovas is making surveys for the establishment of a plant to generate electric energy by hydraulic power. The objects of the power station are stated to be the supply of electric light to the North and South Yungas districts and the working of the Yungas forests. It is proposed to extend the electric tramway from La Paz to the Yungas, in order to facilitate the transportation of timber.—*Board of Trade Journal.*

Bolton.—The L.G.B. has sanctioned the borrowing by the Corporation of £20,000 for electric lighting purposes.

Brazil.—At the commencement of the present year, the central station of the Rio de Janeiro Tramways, Light and Power Co., Ltd., was supplying current to electric motors, aggregating 51,064 H.P. (36,221 H.P.), 288,985 incandescent lamps (173,417), 7,523 arc lamps (5,253), and 1,709 electric fans (1,475). The figures in brackets represent the corresponding numbers at the beginning of the previous year.

Cheam (Surrey).—The P.C. has decided to use electricity in place of gas in such streets as are provided with electric cable.

Chesterfield.—The T.C. has received from the L.G.B. sanction to a loan of £7,000 for the following purposes:—Building extensions at the electricity works, £1,650; additions to plant, £5,350.

The price of current for heating and cooking in the case of lighting customers has been reduced to 1d. per unit.

China.—The westerly Chinese province of Sechuan, through which flows the Yangtse River, possesses numerous waterfalls suitable for the generation of electricity. It possesses also mineral wealth in the shape of salt, natural gas, petroleum, iron, copper and lead, which only await capital and technical skill for their realisation. A step in their development is contemplated by the German Orient Bank, of Hamburg, which has made application for concessions to construct generating stations and build a network of electric railways from the capital Tchingtoofoo to Yunnan, Hupeh and Shansi. The provisional capital is already equipped with an excellent mint and arsenal, the outcome of German enterprise.—*Elek. u. Masch.*

Continental Notes.—NORWAY.—A firm near Larvik is harnessing the Hogstadfos Falls and the erection of the line for transmitting the power to Larvik has already been begun. Constructional work is to be finished by the spring of next year, when it is hoped that 8,000 H.P. will be available.

A company has also received Government permission to make the necessary expropriations for the laying of an electric cable from the Böilefos Falls, in the Nidelven River, to Vindholmen, near Arendal, with a branch to Staknes, for transmitting electrical energy, equivalent to from 20,000 to 30,000 H.P., for the electrical smelting of iron and steel, &c.—*Board of Trade Journal.*

AUSTRIA.—The construction of the new generating station on the Wottawa River, which is projected by the T.C. of Bergreichenstein, has been entrusted to the Vienna branch of Brown, Boveri and Co. It will be built on the Vinzenzsäge, at a cost of £10,000, and the current transmitted underground for the intervening distance of 7 km. The station will form a part of the great scheme to cost £1,400,000 projected on the Wottawa River by the Böhmerwald Electricitäts Gesellschaft, in conjunction with the Union Bank and the International Electricitäts Gesellschaft, of Vienna.—*Der Elektrotechniker.*

The Bohemian Landesculturrat, recognising the importance of supplying the agricultural industry with electricity for light and power purposes, has instructed the Provincial Committee to institute an inquiry among representatives of the agricultural interests regarding the erection and maintenance of power stations, by co-operative societies or otherwise, the probable call for current and other details.—*Zeit. Ostr. Ing. u. Architekten Vereines.*

Schemes have been deposited both by the State Railway Department and by the firm of P. Hagyi Rioto & Co., of Vienna, for the utilisation of the water-power of the Faggenbeck, in the Kaunser Valley. The former proposes to appropriate only the falls on the river from Talboden to near Pruth, to provide current for working the State Railways, while the latter proposes utilising the whole of the falls by the construction of five weirs in connection with a large power station to supply current for industrial purposes.

GERMANY.—A very comprehensive electrical exhibition is to be held at Krefeld this autumn. The use of electricity in minor and large industries, households, restaurants and hotels, in husbandry, the dairy, waterworks, irrigation, &c., will be practically demonstrated. The participation of many leading German firms is announced, and most of the available room is already let.

The city of Ulm, in Wurtemberg, is to have a central power station, the River Argen being used to provide hydro-electric power. A chief and secondary station are to be built, near Steinenbach and Sattel respectively, at an estimated cost of £500,000. Some 12,000 H.P. will be obtained.—*Elektrotech. Zeitschr.*

FRANCE.—The recent establishment of a power station at Hyeres, in the Department of the Var, is having the best results. Not only are neighbouring communes applying for concessions, but the great Creusot establishment has become a client to the extent of 300 H.P. —*La Revue Pratique d'Electricité.*

HOLLAND.—The Dutch Government has decided to improve the harbours of Sourabaya and Macassar, in the Dutch East Indies, and has allotted a sum of 48,000,000 gulden for the purpose. The new quays and other works which will be built will be equipped with the electric light, and electrically-worked cranes and other appliances will be installed.—*Elek. und Maschinenbau.*

Darton (near Barnsley).—Councillor Hanby has given notice of his intention to propose at the next meeting of the U.D.C. that the question of the electric lighting of the township be discussed.

Dundee.—A report by Mr. Harry Richardson, the Corporation electrical engineer, on the proposal to still further extend the undertaking at a cost of about £50,000, has been submitted to the Electricity Committee and adopted. It was agreed to ask for tenders. In his report Mr. Richardson pointed out that increased business which had taken place, and which would probably be added to in the immediate future, rendered it necessary to proceed with an extension of the plant immediately. Having regard to the fact that from 10 to 12 months were required for the delivery of new machinery, which time might be further extended by industrial unrest, the order should be placed as early as possible. The engineer further explained that he proposed to put

in a new generating set of about double the capacity of either the existing ones at Carolina Port, and to allow space for a further set. All the necessary boilers, switchgear, auxiliaries and accommodation required for the extension would, of course, have to be proceeded with also, and he estimated the cost of the extension at £49,000. The town clerk explained that the department had received from the Scottish Office fresh borrowing powers to the extent of £68,000, and this had been obtained without any expense whatever—not even a deputation to London. Mr. J. M. Nairn, convener of the Committee, said that if they did not make such provision as was suggested, they would find themselves in the position of having to refuse to take on consumers.

Ealing.—The annual report of Mr. J. D. Knight, borough electrical engineer, covers the seventeenth year of working of the undertaking, and shows that the past year's trading has been very successful. The output was nearly 70,000 units in advance of the previous year, the number sold totalling 1,573,968, and the income has increased in an even greater ratio, the total for the year being £28,348, an advance of £1,302. The capital outlay during the year amounted to £6 354. Out of the year's revenue, a sum of £8,510 has been allocated to the repayment of loan capital, the repayments to date totalling £72,399, equivalent to 33·8 per cent. of the borrowed capital of the undertaking. Charges for interest, £5,029, were also defrayed out of the year's revenue. The gross profit for the year was £15,792, equal to 7⅜ per cent. on the total loan capital. From the gross profit, charges for interest and sinking fund payments, audit fees, contributions to bad debts, reserve and loan redemption fund, &c., amounting in all to £14,474, were paid, leaving the net profit on the year's working £1,317. A substantial reduction is shown in the cost per unit. Whereas, last year every unit sold cost 3·974d., this year the cost has only been 3·938, nearly 1 per cent. reduction, and represents a saving of £240. The number of consumers increased to 4,550. A feature of the year was the large number of old houses and shops—totalling 82—which have installed electricity. This represents nearly 21½ per cent. of the consumers added during the year, and shows that property owners are recognising that money spent on an electrical installation is fully recouped in the enhanced letting value of houses.

Fermoy, Co. Cork.—At a meeting of the Urban Council on the 17th inst., the chairman said he had received a communication from a firm offering to carry out an electric lighting scheme for the town. He took it on himself to write and say that the Council was prepared to give the firm every facility for the installation of the proposed scheme for electric lighting.

Greenock.—The Electricity Committee has decided that they cannot undertake to give a supply to the power users in Port Glasgow, unless the Port Glasgow T.C. is willing to furnish a guarantee not to sanction an application by any other competent authority to enter Port Glasgow for a period of 30 years. Port Glasgow Electricity Committee recommends that the Council do not give the guarantee asked for. The deadlock is to regretted, as the shipbuilders in Port Glasgow desire a supply of electricity.

The Electricity Committee recommend that Mr. J. A. Robertson, their engineer, be granted an honorarium of £50. The surplus of £5,255 shown in the accounts of the department for the past year will be allocated as follows:—£3,000 to reserve fund (double the amount required by the B. of T.), £2,000 to the relief of burgh rates, and £225 to be carried forward to next year's account.

Honiton.—The B. of G. on Saturday last, decided to accept the offer of the Devon E.L. Co. to install the electric light at the workhouse for £35, and to supply current at 4d. per unit. The Gas Co.'s tender was £54 and 4s. 2d. per 1,000 cb. ft.

India.—The municipal authorities of Kurrachee are meditating large harbour improvement works and the installation of up-to-date goods handling appliances.

Kingswood.—With reference to the proposed revocation of the E.L. Order, 1904, held by the Kingswood Electric Supply Co., to which reference was made in a recent issue of the Electrical Review, the B. of T. has extended the order until the end of the current year.

Liverpool.—A Special Committee has been appointed to investigate the position of the Corporation electrical undertaking, and the staff arrangements necessary in view of the retirement of Mr. Bromley Holmes, the consulting electrical engineer.

Lossiemouth.—A special meeting of the T.C. has discussed the lighting of the town by electricity. A report by Mr. J. Alex. Bell, city electrical engineer, Aberdeen, on the schemes of electric lighting companies which had previously been submitted to the Council, was considered. After consideration, the Council resolved to proceed with a scheme for lighting the town by electric light, provided the cost of the scheme does not exceed a certain figure, and Mr. Bell was appointed engineer, on certain conditions, to prepare plans and specifications with the view of offers being taken for the execution of the works.

Peterboro'.—The annual report of the Corporation Electricity Works has just been issued. For the year ending March 31st last, 892,934 units were generated. During 12 years, deficits paid from the District Fund of the city have amounted to £7,547, but, for some years past, the works have shown a considerable balance to the good. A bad break in the record of success was incurred in 1909-10, an expensive arbitration with the tramway company running away with £1,583 from the rates. Another arbitration is now pending.

Rochdale.—The Gas and Electricity Committee has decided, on the Works Sub-Committee's recommendation, to supply electricity in bulk to the Milnrow district.

St. Mellons.—The South Wales Electrical Power Distribution Co. has informed the R.D.C. that it intends applying to the B. of T. for a prov. order for electricity supply for the parishes of Bedwas and Machen Upper. The Council has asked the company for its proposed scale of charges for current.

Surbiton.—Messrs. Callender's have agreed with the U.D.C. to pay interest and sinking fund charges at the rate of 6¼ per cent. per annum in regard to legal expenses and fees which were not included in the loans sanctioned for electric lighting.

Wakefield.—The T.C. has decided not to support the Bill seeking powers for local authorities to provide electrical fittings and to undertake wiring work.

Weardale.—A scheme for supplying electricity to Wolsingham, Frosterley and Stanhope, has been submitted to the R.D.C. by Mr. A. Martin, of Wolsingham, but the Council has decided to take no steps in the matter.

Whitehaven.—The T.C. has sanctioned the purchase of of an electrical cooking outfit, the electrical engineer having expressed the opinion that there is a large field for hiring out such utensils, as cooking by electricity can be done with more satisfactory results and more economically than with any other form of heating.

TRAMWAY and RAILWAY NOTES.

Ashton-under-Lyme.—As the result of an interview, the threat by the Hurst Council to close the tramway in its district has been withdrawn. The truce will last for one month. The 10 years' agreement between the two authorities expired on the 16th inst.

Australia.—The Hobart Electric Tramway Co. (Tas.) has accepted the Hobart Council's offer for the purchase of the tramways; the price offered was £210,000. A Bill to obtain the necessary authority from Parliament to borrow the money had been drafted in anticipation of the acceptance of the offer. It has not yet been decided by the City Council whether the money shall be obtained from the Government under the Local Government Act or borrowed from the general public by means of debentures.

Chile.—Plans submitted by Don Horacio Valdés for the construction of an electric railway between Santiago and Penaflor have been approved. Three years are allowed for carrying out the work.

Continental Notes.—Sweden.—Since the exhaustive trials made some years ago near Stockholm with electric traction, the question of the electrification of the State railways has been an order of the day. Those trials led, at the time, to the proposals for the electrification of the southern network, and to the conversion of the frontier railway. There can be no doubt, however, that the present Swedish Government will wait the results of experience from the working of the lines now in hand before proceeding with the larger schemes. This is shown by the admission of the Minister for the Home Department in Parliament recently, and also by the fact that no plans for large electric conversions have been drawn up. In the course of reference to the Tomteboda-Wartan line which is being electrically worked, the Minister observed that it afforded no data as to the cost of rolling stock. Nevertheless, electric working for local traffic was a solved problem. Electric working on an extended scale was, moreover, a necessity for Sweden, as thereby she would become independent of foreign coal, and her own sources of power would be better utilised. A surplus would also remain for appropriation for other purposes. Experience in other countries showed that electrification in some cases was advantageous; in other cases not so. In no case, however, were the circumstances exactly comparable with those in Sweden; whence it followed that they must obtain their own experience. Electrification could not, therefore, be considered until data regarding the extent of the country's water resources were obtained, and extensive tests over lengthened periods carried out. The frontier railway, when completed, would supply conclusive data. Furthermore, the results of the building of the northern internal line, with its branch to the main line, must be awaited. Lastly, the Minister declared that at the present time it remained to be considered whether various local lines were being electrified as quickly as was desirable. On the supposition that their electrical working was remunerative, plans for their conversion would shortly be prepared.—*Elektro. und Maschinenbau.*

Spain.—The Municipal Council of Cartagena has granted a concession for the establishment of an electric tramway in Cartagena which shall also supply that city with electric light and power. The concession is for 40 years, at the expiration of which period the city has an option on the purchase of the plant at 80 per cent. of its value at that time. The concession is granted on condition that the concessionaire negotiates a loan of £80,000 in favour of the municipality; failure to negotiate this loan voids the concession.—*Financier.*

(*Continued on page* 303.)

THE QUEEN'S HEAD ELECTRIC RESTAURANT.

Some few months ago the electrical Press was privileged to inspect the equipment of the Queen's Head Electric Restaurant, which forms such a prominent feature of the "Shakespeare's England" Exhibition at Earl's Court this year.

Through the courtesy of Mr. R. S. Downe, of the Brompton and Kensington Electricity Supply Co., the hon. manager of this restaurant, we were able to give a general description of the apparatus then installed, and he has kindly placed at our disposal further information based on experience gained during the period in which the restaurant has been in daily use.

It may be remembered that the catering is in the hands of the London Home Delicacies Association, of 9, New Bond Street, W., and that the electric restaurant was fitted up by arrangement with the British Electrical and Allied Manufacturers' Association, and the Electric Supply Publicity Committee.

The equipment was supplied by the following firms:—Messrs. The Electric and Ordnance Accessories Co., Ltd.; Ferranti, Ltd.; General Electric Co., Ltd.; T. & J. Jackson, Ltd.; Purcell & Nobbs; Siemens Bros. Dynamo Works; and Bertram Thomas. A detailed list of the apparatus supplied by these firms appeared in our pages at the time.

The manufacturers supplied apparatus from stock, mostly of the domestic type, and although this apparatus worked satisfactorily, it was found that it was not suitable for restaurant purposes, owing to its not being capable of meeting the large simultaneous demands for grills, &c.

To meet this difficulty the Publicity Committee supplemented the equipment with several pieces of special restaurant apparatus which have proved to be capable of meeting the sudden rushes in the restaurant, and have given every satisfaction to the chefs both as regards convenience, cleanliness and quality of cooking.

The principal additions have been a combined griller, toaster and hot cupboard of the following dimensions:—5 ft. 6 in. wide, 6 ft. high, and 1 ft. 10 in. back to front, comprising two grilling compartments 21 in. × 18 in., giving a total grilling space of 5¼ sq. ft. Between the grills there is a centre chamber, forming a hot cupboard, and over this a tier of hot cupboards, with sliding doors, running the full length, and a heating space under the grill, fitted with grids. The grilling elements are sub-divided into six sections, each of 2,500 watts, each section being controlled by an Admiralty pattern pull-and-push switch.

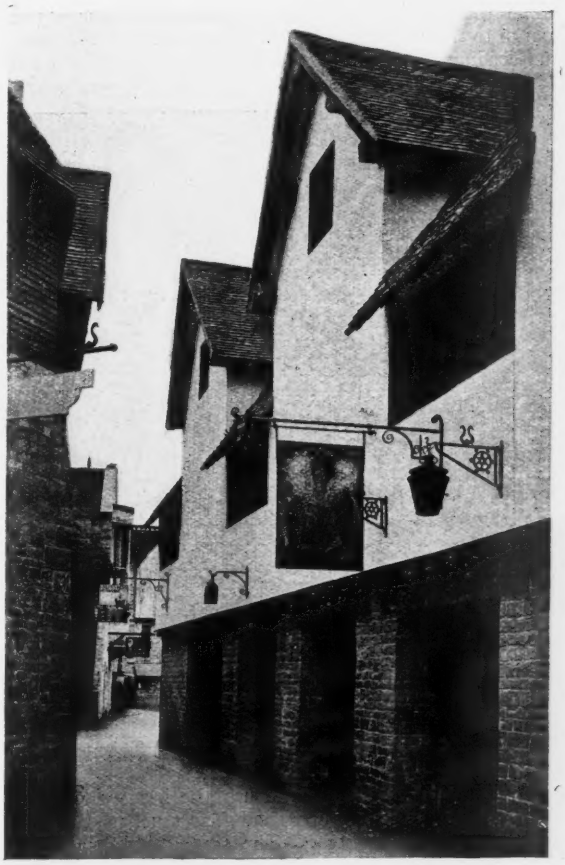


Fig. 1.—The Queen's Head Electric Restaurant, Earl's Court.

There has been a big demand for grills in the restaurant, and the following is typical of the demand made each evening between 7.30 and 9.30:—

Rump steaks, 24; fillet steaks, 12; loin chops, 20; chump chops, 8; cutlets, 46; kidneys, 20; tournadoes, 18; ham, 4; sausages, 12; salmon steaks, 17; soles, 3—making a total of 184.

Current supplied to each half of the grill, and to all pieces of apparatus in use is metered, the current consumption on the grill working out at between a quarter and a third of a unit per grill, according to the demand.

It must be borne in mind that a grill varies between a porter-house steak and two devilled kidneys. The consistent excellence of the grilling has been much commented upon, and the uniform temperature conditions greatly appreciated by the chefs.

A vegetable steamer has also been added having a capacity of 160 lb. of potatoes per hour, or an equivalent amount of puddings and fish. The overall dimensions of this steamer are 4 ft. 10 in. high, 1 ft. 9 in. wide, and

Fig. 2.—General View of Interior of Restaurant.

2 ft. 4 in. back to front. It contains five wire vegetable baskets, each 20 in. × 13½ in. × 3 in. deep, and is fitted with an automatic supply system which keeps the steam generator supplied with water automatically.

The cooking is done under a pressure of steam varying from ·5 to ·75 lb. per sq. in., and the steamer has a maximum loading of 5 kw., arranged in two heats.

Fig. 3.—View of the Electrical Cooking Apparatus at One End of the Restaurant.

In practice it is found that 2½ kw. is sufficient to keep the apparatus working at full capacity.

A restaurant type Bain Marie has also been added, containing six vegetable containers and four sauce pots, heated by an open type water bath. The size of this apparatus is 64 in. long, 34 in. high, 22 in. back to front, and it has been found of sufficient capacity for the whole of the vegetables and sauces required in the restaurant.

One carving table has been found capable of handling all the joints required for the restaurant, and the hot cupboards underneath have had a sufficient capacity for heating all the plates and dishes required.

The fish fryer has been worked very hard since it was installed at the opening of the Exhibition, and the chef is very satisfied with its behaviour. The articles cooked have been so numerous it has been difficult to keep account of them, but it has dealt with the whole of the fish fried and potatoes.

Practically all the roasting has been done in an Eclipse oven of boarding house size, and a Bertram Thomas oven, No. 2 size. To give some idea of what can be cooked in two ovens, the following articles were roasted to meet a Saturday's demand :—Two sirloins of beef, one fore-rib of beef, 50 to 60 lb. of beef, one whole lamb, eight ducks, 10 chickens and six or seven large fruit tarts.

Both these ovens have worked splendidly since the opening of the Exhibition, and are in daily use.

The large ham boiler has given no trouble, and three York hams are being regularly cooked in about five to six hours.

The small grills supplied by Messrs. Purcell & Nobbs, Messrs. T. & J. Jackson and the General Electric Co. worked exceedingly well, and since being replaced by the large grill are being used for making toast and grilling fish.

In the views some of the apparatus is clearly shown, but several pieces are hidden by the counters.

The Eclipse hot water urns and the Siemens café-au-lait have been working daily, and occasionally have served 150 teas in one and a half hours; these urns would be greatly improved if the filling was carried out automatically.

In addition to the main cooking equipment, the manufacturers have supplied a large assortment of electrical accessories, which have been shown working, and have created considerable interest, at the Information Bureau in the restaurant; a large amount of literature dealing with the electrical accessories has been distributed amongst the customers.

The electrical cooking equipment is the largest which has so far been got together, and the chefs who have been working it have been very pleased with the comfortable conditions under which cooking has been carried out. Practically all the cooking has been done in the restaurant itself, and as the atmosphere has remained quite fresh, this points to the fact that with attention to the ventilation, cooking may be carried out on a considerable scale by electricity in places where it has not previously been possible.

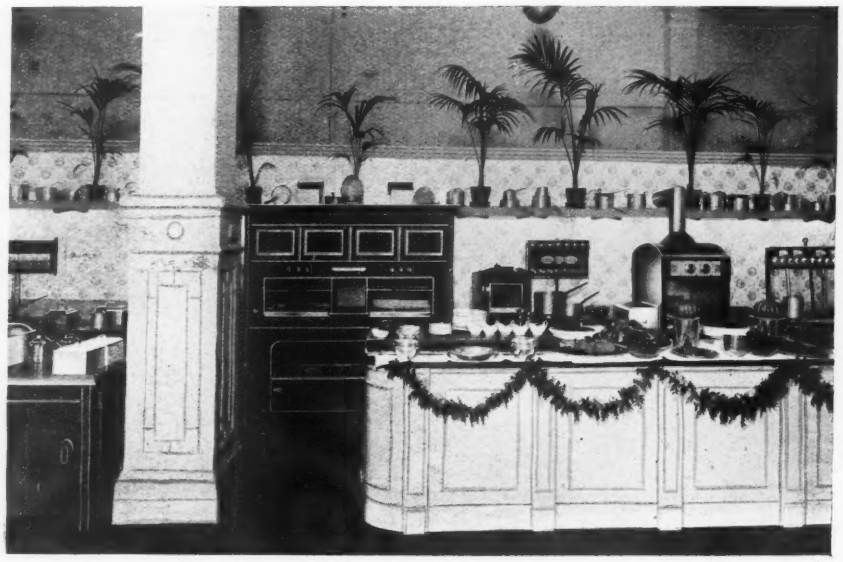


Fig. 4.—The Large Electric Grill, Queen's Head Restaurant.

The number of meals served in the restaurant works out approximately at 1,200 luncheons and dinners, and 500 teas per week, making an average total of 1,700 meals, while the units metered at the apparatus are some 1,500 per week.

ELECTRIC FARM EXHIBIT IN AMERICA.

A recent issue of our trans-Atlantic contemporary, the *Electrical Review and Western Electrician*, contains a very good account of a portable exhibit of electrical farming machinery and appliances, which has been got together by the Edison Electric Illuminating Co., of Boston.

Some months ago the superintendent of this company inspired his associates with the practicability of an enterprise of this sort, and we gather that, for six weeks prior to the present month, the attendance of potential users — not including mere sightseers—averaged about 100 a day.

The exhibit, or "The Farm," as it is termed, consists of some 40 large pieces of apparatus and farming tools, together with 30 or 40 of the ordinary and smaller appliances, in a big tent, 60 × 106 ft. in size. All the apparatus is practical for use and for economic service on the average farm. Each appliance is plainly marked with its name, the manufacturer, its price, and the cost of operation. The price is retail, and includes the machine, its motor, and everything ready for actual service on the farm. In the front of the tent, display signs have been placed, to add some of the drawing effect of the high-class circus. The tent is lighted by 500-watt Mazda lamps inside and by luminous arcs outside.

Fig. 5.—Demonstration Table and Information Bureau for Small Apparatus, Queen's Head Restaurant (page 300).

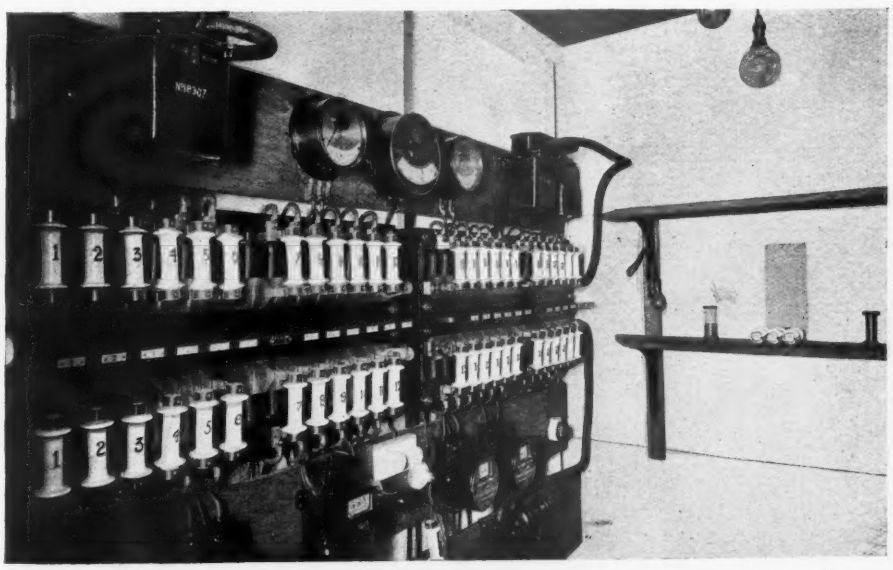


Fig. 6.—The Distribution Board Controlling the Cooking Circuits, Queen's Head Restaurant (page 300).

Two electric trucks, one of 2-ton capacity by the General Motor Truck Co.; and another of 700-lb. capacity manufactured by the Walker Vehicle Co., are used in connection with the farm for hauling material to and fro. A special feature of the truck service has been the demonstrations for the neighbouring farmers. Wherever the farmers have shown interest in the truck, the vehicle suited to the service has been sent out to haul loads on the farm. From time to time material has been carried from farms into town, or *vice versâ*. The result has been that many of the farmers have now a practical knowledge of the working efficiency of an electric truck on the farm, and are considering its adoption.

A partial list of the apparatus shown on the farm is as follows :—Cider mill, vegetable cutter, electrobator, electric brooder and bone cutter, milk tester, milking machine and vacuum-cleaner outfit, butter churn, cream separator, bottle-washing machine, grindstone, horse clipper, forge blower, circular saw, wood saw, wood splitter, portable breast drill, furnace blower, meat chopper, oat crusher, electric pump for farm storage supply system and irrigation, pumping jack for attachment to windmill outfits, motor-operated sewing machine, vegetable peeler, battery-charging rectifier outfit, icecream freezer, corn sheller, clover cutter, feed grinder, friction windlass, ensilage cutter, hay unloader, electric kitchenette, washing machine, flat-irons, and electric household utensils, as well as buffing and grinding outfits, and all electric appliances for use in a carpenter or repair shop.

The authoritative tests of the efficiency of some of the important pieces of apparatus at the farm show the following results :—

Clover Cutter.—0·5-H.P. motor; rate per hour, 41 lb. of finely cut clover; KW.-hours per 100 lb., 0·870; average H.P., 0·48.

Milking Machine.—Capacity, 10 machines, 20 cows; 3-H.P. motor; tests, eight machines used, 90 cows milked; give 432 quarts milk; rate per hour, 91 cows; KW. per hour, 0·019; average H.P., 2·3.

Corn Sheller.—Capacity, 26·5 bushels Flint corn per hour; KW.-hours per bushel, 0·0278; average H.P., 0·98.

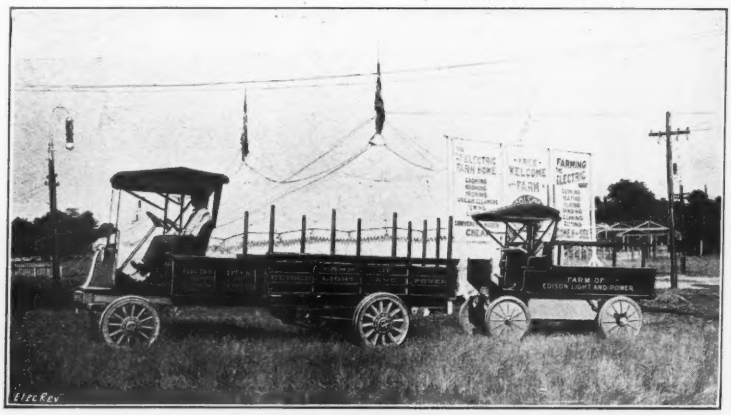
Washing Machine.—Capacity, six sheets per washer-full;

0·125-H.P. motor; rate per hour, six washer-fulls; KW.-hours per washer-full, 0·0232; average H.P., 0·187.

Feed Grinder.—Capacity, 6·2 bushels per hour with 5-H.P. motor; grinding shelled Flint corn fine; rate per hour, 6·02 bushels; KW.-hours per bushel, 0·710: average H.P., 5·9. Grinding Flint ear corn fine, 4 bushels per hour; 5-H.P. motor; KW.-hours per bushel, 0·888; average H.P., 4·7. Grinding Flint corn and oats, half and half, 4·6 bushels per hour; KW.-hours per bushel, 0·821; average H.P., 5·08.

Oat Crusher.—Capacity, 50·5 bushels per hour; 2-H.P. motor; KW.-hours per bushel, 10·5; average H.P., 3·04.

Ensilage Cutter.—Capacity, 2·6 tons of rye per hour; 10-H.P. motor, KW.-hours per ton, 3·11; average H.P., 11·3.



Electric Trucks used at the Farm Exhibition.

The farm is equipped with a motor on a portable truck, which can be moved from place to place and connected up with any piece of apparatus. This shows the practicability of portable electric power on the farm.

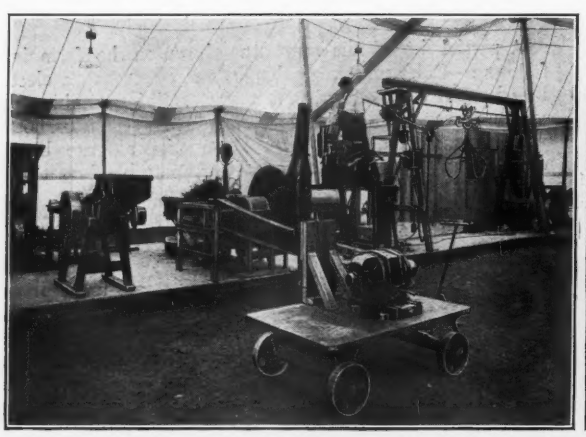
The milking tests prove very attractive for the people, and there is always a crowd at the evening milking time.

towns during the summer, having, in the first instance, been located near Boston.

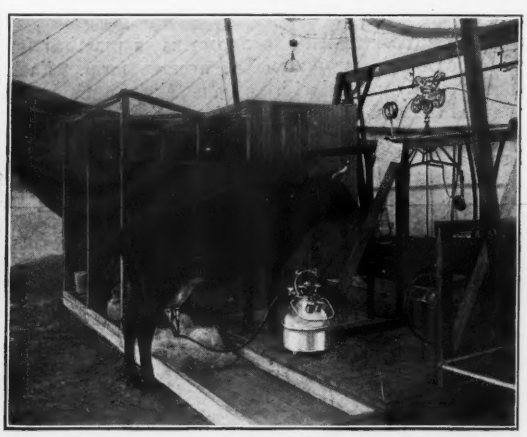
Although American and English farming methods differ considerably, and English farming is not generally accounted a very lucrative undertaking, there is good reason for supposing that considerable scope exists in this country for electrical farming developments in certain districts—indeed, we have in mind a charming rural area in this country centring on an old cathedral city where, through the enterprise of the electrical engineer, many local farms have been supplied with electricity by cheap pole lines, and are using both electric light and power for various purposes.

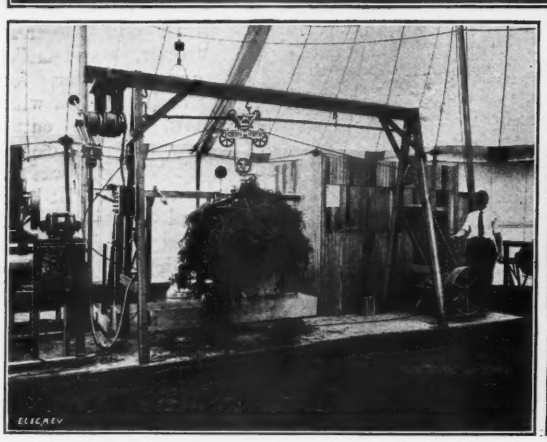
It is also well known that great progress has been made in Germany, which country is one of our best customers for steam ploughing tackle, in the introduction of electric ploughing, as well as in the minor applications of electricity

Portable Truck with Feed Cutters, Grinders, &c.

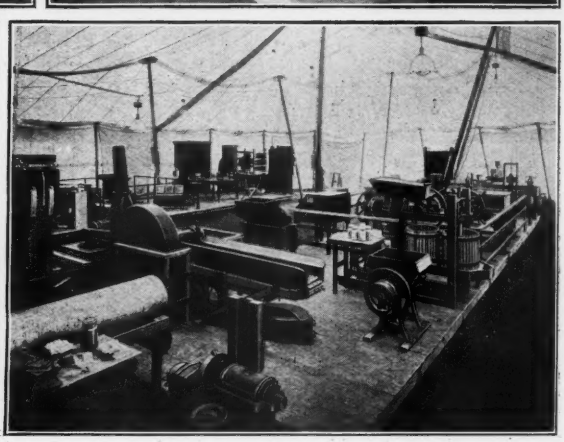


Cow with Electric Milking Apparatus.





Electric Hay Unloader in Use.



Farm Exhibits in Foreground and Home Section in the Distance.

Electric Farm Exhibit in America.

Practical milking demonstrations have been given at large near-by dairy farms, to the great satisfaction of dairymen.

The exhibit, we gather, is resulting in excellent business, and purchases of apparatus are directly traceable to the inspiration gained by visitors; it is to be moved to various

to farm work, while reference to our columns last week shows that both in Australia and Canada developments along the same lines are being made.

In conclusion, we have to thank our contemporary for the illustrations which appear on this page.

TRAMWAY and RAILWAY NOTES.

(*Continued from page* 298.)

France.—The trials to which we referred last week, with a new combined electric locomotive and passenger coach intended for the French State railway line between the Invalides station (Paris) and Versailles, were made with a coach which runs on a couple of four-wheel bogies, and is entirely constructed of iron and steel, with the object of obviating any risk of fire. It contains not only the driver's portion, but also first and second-class passenger compartments and a luggage department, so that during the slack period it can be used as a complete unit, while at the busy times, trailer-cars can be added. The electrical equipment comprises two 250-H.P. motors, which will enable the machine to attain a speed of 50 miles per hour on the level, and from 34 to 38 M.P.H. on the gradients. The coach, which can be driven from either end, has a total length of nearly 74 ft.

The Compagnie Generale d'Omnibus, which runs a large fleet of petrol motor-'buses in Paris, is reported to be about to make some trials of a new electrically-propelled omnibus.

A scheme for the electrification of six railway lines radiating from Valenciennes is being promoted, viz.: Valenciennes to St. Amand, Condé, Bonsecours, Hergnies, Denain, and Blanc Misseron.

Dewsbury.—The recent action of the Yorkshire (Heavy Woollen District) Electric Tramways Co. in establishing a general increase in tramfares on its system has called forth, as might have been expected, quite a storm of protest on all hands. The latest expression of disapproval is a resolution of the General Purposes Committee of the Dewsbury T.C., who, in addition to protesting against the increases in passenger fares, instructed the town clerk to ask the Batley Corporation and the District Councils of Birstall, Heckmondwike, Cleckheaton and Gomersal to take similar action. At the meeting last week at which this resolution was passed, a letter was read which had been received from Huddersfield Corporation with reference to the proposal to extend the Huddersfield tramways from Cooper Bridge, through Mirfield and to a point within the borough of Dewsbury, and was referred to a special committee.

Dundee.—The attention of the Corporation Tramways Committee was directed by a communication from the Municipal Tramways Association to the fact that the Post Office authorities were seeking to place bare telephone wires over trolley wires, and to call upon local authorities to erect guard wires to protect these. The Association had approached the Postmaster-General with a request that he should receive a deputation on the subject, but no reply had been received, and it was suggested in these circumstances that Dundee Corporation and other authorities in the event of a request being made to them to have guard wires erected, should refuse until the point in dispute had been settled. The manager supported the proposal, and the Committee agreed.

It has been suggested to make use of tramway poles for street lighting purposes. On the opinion being expressed that the B. of T. would disallow gas-pipes being attached to electric standards, it was pointed out that they might be led up the outside of the standards, and properly insulated. The Corporation Lighting Committee is to have a report on the matter from a Special Committee.

Huddersfield.—Members of the Huddersfield Tramways Committee, accompanied by the tramways manager and surveyor to the Huddersfield Corporation, together with the surveyor to the Mirfield U.D.C., have made an inspection of the proposed Mirfield tramway route.

The Dewsbury Corporation has appointed a special committee to consider and report upon the proposal of the Huddersfield Corporation to extend its tramway system into the boundary of Dewsbury.

The Elland District Council has also received a communication from the Corporation, asking whether the offer of the Council made some time ago to subsidise the tramways to the extent of £100 per annum for a certain period, still holds good, seeing that the Corporation now proposes to obtain Parliamentary powers to extend its system to Elland. The District Council has decided, before definitely replying to ascertain what steps other authorities are taking in the districts which the Corporation proposes to touch by its extended system.

The Linthwaite U.D.C. has consented to an extension of the Huddersfield tramways from the terminus at Linthwaite to the boundary at Slaithwaite.

Keighley.—A recommendation has been made that a scheme be prepared for a system of railless trolley vehicles between the tramway terminus at Ingrow and the junction of Haworth Road and Hebden Road, and to obtain tenders for the necessary equipment.

L. & Y. Electrical Services.—This company has been experimenting recently with a new type of electric locomotive, which it is proposed to use for hauling goods traffic on the electrified lines. Tests have been carried out between Marsh Lane and Aintree, the new locomotive drawing about 700 tons up this gradient. If the present experiments are entirely satisfactory, larger engines of the same type will be provided, chiefly for use in connection with the goods traffic between the Liverpool docks and local stations.

New Zealand.—The Board of Management of the Wellington City Tramway services have issued a lengthy report on the subject of losses incurred in working the cars. Recommendations are made to shorten some of the 1d. fare sections, to withdraw concessions which favour distant places, to limit scholars' tickets to those under the age of 17, to institute a minimum 3d. fare on Sundays and to issue blocks of 14 1d. tickets for 1s.

South Africa.—The ratepayers of Bloemfontein have agreed to borrow £80,000 for the flotation of a scheme to provide a system of railless traction. A poll, however, was demanded by the opponents of the scheme.

Widnes.—At a T.C. meeting recently it was reported that there had been a loss on the motor-'bus service for the past three months of £560, and a reduction in the passengers carried of 96,000 compared with last year. The clerk said the actual loss on the running was £285, and the total was made up by interest, &c., because the Government forced them to pay the money back in five years.

TELEGRAPH and TELEPHONE NOTES.

Australian Wireless Notes. — According to the *Standard*, the final settlement of the wireless dispute has been delayed by the illness of the Postmaster-General, the Hon. Charles E. Frazer. It will be recalled that the Commonwealth Government had expressed its willingness to pay a fair price to the Marconi Co. for the use of patents said to have been infringed in the system adopted by the Federal Post Office. The local representatives of the company have offered to accept £50,000 for the Marconi rights involved.

Mr. J. C. Balsillie has been testing for the Commonwealth authorities the radio-telegraphic installations at Adelaide, Brisbane, Hobart, and Melbourne, which are on the point of being taken over by the Australian Postmaster-General. At Adelaide and Brisbane the installations are of a hybrid character, a ground wire system being used in conjunction with masts 140 ft. high. The effect of the combination is said to reduce the marked difference between the day and night ranges of communication. At Melbourne, where the mast is 185 ft. high, the day range is 400 miles, as against 1,500 miles at night.

France.—For the convenience of the French commercial world, the wireless telegraph station at Bordeaux has now been opened for the tranmission of ordinary private messages.

French Telephones.—The Administration des Postes et Telegraphes have decided on the establishment of telephone and telegraph lines in 57 towns and townships throughout France. The following 12 cities have also decided to set up or extend their municipal telephone and telegraph systems:—Caen, Rouen, Honfleur, Troyes, Laval, Deauville, Marizy, Levallois, Montagnac, Malakhoff (Seine), Casteljalous and Beauville.—*Revue Pratique de l'Electricité.*

Japanese Cable Extension.—It is reported that owing to the pressure of messages, the two telegraph cables between Tokio, Japan, and the Island of Formosa, are quite unequal to the demand, and that negotiations are in hand for the laying of a third cable between the two places.

Proposed New Cables.—It is announced in the *London Gazette* that an application has been received by the Board of Trade from the Great Northern Telegraph Co., Ltd., of Denmark, for a licence to lay down and maintain, upon the foreshore and bed of the sea at Newbiggin-by-the-Sea, Northumberland, two additional telegraph cables, one from Denmark and one from Sweden.

South American Wireless Developments. — The Telefunkengesellschaft, of Berlin, has just successfully inaugurated a wireless connection across South America, from Lima on the West Coast to Para on the East Coast. This connection, which passes for 3,400 km. over primeval forest land, is the longest yet effected by the Telefunken system. The Andes range, 5,000 to 6,000 metres high, and the primeval forest districts along the Amazon River, are thus bridged without the aid of telegraphic cable. Telegrams given in at Lima are forwarded to Manaos on the Amazon River and their contents then dispatched per wireless to Para, 1,200 km. distant.—*Elektrotechnische Nachrichten.*

Vatican's Wireless Station.—A wireless telegraph station is to be installed shortly at the Vatican, under the direction of Signor Marconi.

Wireless Telegraphy at Bangalore.—Mr. Simpson, chief electrical engineer, Indian Telegraphs, visited Bangalore recently to examine conditions as to the suitability of this station for a wireless installation and to confer with the local authorities on the subject. It is by no means certain, in spite of previous statements, that Bangalore has been, or will be, decided on as a centre. Much is likely to depend on the result of Mr. Simpson's investigations.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberaman.—September 11th. Electrical fittings, for the Powell Duffryn Steam Coal Co., Ltd., 101, Leadenhall Street, London, E.C. Stores Manager, Aberaman, near Aberdare (Form No. 26).

Australia.—New South Wales.—September 25th. Trunk line switchboard, for the P.M.G.'s department. See "Official Notices" to-day.

October 2nd.—N.S.W. Government Railways. Six 1,000-kw. sub-station units to specification No. 357. Specification (10s.) from Electrical Engineer's Office, 61, Hunter Street, Sydney.

October 16th.—N.S.W. Government Railways. Two 5-ton electrically-driven travelling cranes, for the Randwick workshops. Specification No. 365 (5s.). Electrical Engineer's Office, as above.

South Australia.—October 1st. Telephone switchboards at Unley, Adelaide, for the Postmaster-General's department. See "Official Notices" to-day.

October 1st.—Telephone switchboards at Norwood, for the P.M.G.'s department. See "Official Notices" to-day.

October 22nd.—Telephone switchboard at Port Adelaide, for the P.M.G.'s Department. See "Official Notices" to-day.

Victoria.—September 3rd.—Six 60-k.v.a. transformers, for the Melbourne City Council. See "Official Notices" August 16th.

September 17th.—One fuel economiser, for the Melbourne Corporation electricity works.

October 2nd.—Two vertical sets of electrically-driven rotary pumps, for the Melbourne City Council. See "Official Notices" August 16th.

October 22nd. Fourteen sections of common-battery multiple switchboard, for the P.M.G.'s department. See "Official Notices" to-day.

Western Australia.—November 5th. One common-battery automatic switchboard, one common-battery semi-automatic switchboard, one common-battery manual switchboard and equipment, for the P.M.G.'s department, Perth.

Austria.—Vienna.—November 30th. Plans are required for the erection and operation of an electrically-worked municipal central clock installation. Particulars, Magistratabteilung V, Vienna.

September 2nd.—The authorities of the K.K. Northern Railway in Vienna are inviting tenders for an installation of electric lighting at the railway station at Prerau.

Bedwas.—September 5th. Electrical goods for a year for the Bedwas Navigation Colliery Co., Ltd. (Form 4). The Secretary.

Belgium.—September 3rd. The Société Nationale des Chemins de Fer, of Brussels (14, Rue de la Science), is inviting tenders for the supply and installation of the electrical equipment of a transformer sub-station at Dieghem, and the supply of copper rail bonds and bronze wire required by the company during the year ending October 1st, 1913. For further particulars see this column last week.

Bolton.—The Electricity Committee of the T.C. has directed tenders to be invited for 25,000 tons of coal for the works.

Bradford.—August 28th. One 300-kw. and one 1,500-kw. rotary converter, for the Corporation. See "Official Notices" August 16th.

Costa Rica.—December 9th. Tenders are invited for the building and working of an electric tramway between Alajuela and Grecia, a distance of 18,100 m. Particulars from the Secretaria de Fomento, San José.

Felixstowe and Walton.—September 5th. Extensions to accumulators and balancer-booster, for the U.D.C. See "Official Notices" to-day.

France.—October 8th. The French State Railway authorities in Paris are inviting tenders for the supply of the power necessary for the electrical operation of the State railway system in the Paris district. Particulars may be obtained from, and tenders are to be sent to, Le Directeur des Chemins de Fer de l'Etat, 20, Rue de Rome, Paris.

Germany.—Hanover.—September 5th. The supply and delivery of a revolving coal-loading crane to the water-power station at Döverden on the Weser is required. Particulars (2 marks) of the Royal Machine Construction Office, Brandstrasse 1, Döverden, Hanover.

Brunsbuttelkoog.—September 9th. Tenders are invited for the supply of Diesel motors with accessories, electric pumps with accessories, dynamos, generators, transformers and accumulators. Particulars of the Kanalbauamt I, Brunsbüttelkoog, Germany.

Hungary.—The municipal authorities of Dunafeldvar have lately invited tenders for the establishment of a central electric lighting station in the town.

Leeds.—September 9th. Paper-insulated cables, for one, two or three years, for the City electric lighting department. See "Official Notices" August 9th.

Leicester.—August 31st. Steel roof trusses, lattice girders, and columns for extensions to main tramcar depôt, for the T.C. Borough Surveyor (returnable deposit of £1).

London.—L.C.C.—September 24th. Electric spark gaps in brick cells for sub-stations. See "Official Notices" to-day.

Manchester.—September 10th. One 12,000-kw. three-phase high-pressure turbo-alternator, with condensing plant, &c., water-tube boilers and superheaters, economisers and coal chutes, for the Corporation. See "Official Notices" August 9th.

August 28th.—Electric lighting fittings at Atherton Street Schools, Deansgate, for the Education Committee. The Offices, Deansgate. (Returnable deposit £1 1s.)

Rathmines and Pembroke.—August 29th. The Joint Hospital Board invites tenders for the electric wiring of two of the hospital buildings, the staff residence, gate lodge, and also electric lighting of drive at their Isolation Hospital at Clonskeagh. General conditions, specification, &c., from the Matron, Isolation Hospital, Vergemount, Clonskeagh, on payment of 2s. 6d., which will not be refunded. Tenders to Chairman, Joint Hospital Board, Town Hall, Rathmines.

Rochdale.—August 28th. Surface condensing plant, D.C. motors, electrical sundries and cast-iron pipes, for the Union workhouse. See "Official Notices" August 16th.

Rosario.—October 15th and September 21st. According to the *Review of the River Plate*, the Municipality is calling for tenders, until October 15th, for a second system of electric tramways, including their construction and working. Full particulars from the Municipality. Tenders for the public electric lighting will be opened on September 21st.

Roumania.—Botoshani.—Tenders are invited for the installation and working of an electric light and power service. Particulars of the municipality.

South Africa.—September 11th. Durban Corporation. One-ton electric storage battery vehicle. A statement on the matter can be seen at the Board of Trade C.I. Department, London, E.C.

Spain.—September 30th. Tenders are being invited by the Spanish Ministerio de Fomento in Madrid for the concession for the construction and working of an electric tramway in the town of Gijon (province of Oviedo).

Torquay.—September 2nd. One 1,000-kw. single-phase turbo-alternator, condensing plant and switchgear, for the T.C. See "Official Notices" August 16th.

Turkey.—August 29th. Ten dynamometers and 1,050 iron telegraph posts, 6 metres long. Tenders to Economat du Ministère des Postes Télégraphes et Téléphones. Deposit 10 per cent. Local representation.

West Hartlepool.—September 3rd. High-tension three-core paper-insulated cables and low-tension rubber cables and wiring, for the Corporation. See "Official Notices" to-day.

CLOSED.

Ashton-under-Lyne.—The Corporation has accepted the following tenders:—

Balcke & Co., London.—Two air filters, for turbo-generators.
W. H. Allen, Son & Co.—Two sets of condensing plant, &c., for the electricity works.
Bradford Engineering Co.—Cooling tower at electricity works.

Crook.—The U.D.C. has accepted the tender of Messrs. Pease & Partners for the installation of 14 electric lights at Roddymoor, at £80, and their offer to maintain the whole of the lamps in the district at 5s. each per annum.

France.—The India-Rubber, Gutta-Percha and Telegraph Works Co. have been allotted portions of the service contracts for various descriptions of cables recently required by the Administration of Posts and Telegraphs, Paris.

Glasgow.—Provincial Cinematograph Theatres, Ltd., of London, have accepted—in connection with the reconstruction of the Picture House, Sauchiehall Street—the tender of Messrs. Malcolm & Allen, Ltd., for the wiring, at £702, and that of Messrs. G. N. Haden & Sons, for the low-pressure hot-water heating installation, at £979.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named:—

War Office.

Accumulator batteries.—Tudor Accumulator Co., Ltd.
Electric cable.—Hooper's Telegraph and India-Rubber Works, Ltd.
Incandescent lamps.—Brimsdown Lamp Works, Ltd.; British Thomson-Houston Co., Ltd.; Corona Lamp Works; Cryselco, Ltd.
Telegraph poles.—Bullers, Ltd.

India Office: Store Department.

Arresters, &c.—General Electric Co.
Motor convertor, &c.—Bruce Peebles & Co.
Projectors, &c.—Siemens Bros. & Co.

Crown Agents for the Colonies.

Telephone materials.—British L.M. Ericsson Manufacturing Co., Ltd. Western Electric Co., Ltd.
Train lighting dynamos.—Mather & Platt, Ltd.

Office of Works.

Electrical conduit boxes.—Barton & Sons; General Electric Co.; Perfecta Co.; Walsall Hardware Manufacturing Co.
Generating set at British Museum extension.—Browett, Lindley & Co., Ltd.
Main switchboard at British Museum extension.—Drake & Gorham, Ltd.
Main cables and additions to switchboard at Natural History Museum.—Siemens Bros. & Co., Ltd.

General Post Office.

Telephonic apparatus.—British L.M. Ericsson Manufacturing Co., Ltd.; Gent & Co., Ltd.; Sterling Telephone and Electric Co., Ltd.
Electric light cable.—Hooper's Telegraph and India-Rubber Works, Ltd.
Submarine cables.—Siemens Bros. & Co., Ltd.
Telephonic cable.—Henley's Telegraph Works Co., Ltd.; Johnson and Phillips, Ltd.
Insulators.—Taylor, Tunnicliff & Co., Ltd.
Telegraphic wire.—Rylands Bros., Ltd.; Shropshire Iron Co., Ltd.; F. Smith and Co., Wire Manufacturers, Ltd.
Telephonic wire.—T. Bolton & Sons, Ltd.; British Insulated and Helsby Cables, Ltd.; J. C. Fuller & Son, Ltd.; London Electric Wire Co. and Smiths, Ltd.; Chas. Macintosh & Co., Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., incorporated in the London Electric Wire Co. and Smiths, Ltd.
Automatic call wire distributing equipment, Leeds.—The Automatic Telephone Manufacturing Co., Ltd.
Do. at Central Telephone Exchange, London, E.C.—Siemens Bros. & Co., Ltd.
Telephone Exchange equipment, London Wall, E.C., and Port Talbot.—The Western Electric Co., Ltd.

Margate.—The T.C. has accepted the tender of Messrs. Stuart & Moore for additional electric fire alarm posts, at £40.

Reigate.—The T.C. has sealed a contract with Messrs. Rickett, Cockerell & Co. for coal for the electricity works.

Rotherham.—The T.C. has accepted the tender of the Pulsometer Co., Ltd., for a motor pump, at £130.

Salford.—The B. of G. has accepted the tender of Messrs. R. O'Brien & Co., of Manchester, for E.L. and fire alarms at the infirmary, at £2,832. Fourteen tenders were received, the lowest being £2,123, and the highest £3,378.

Scarborough.—The tender of Messrs. Walker & Hutton, of Scarborough, has been accepted for the electrical installation at the new Roman Catholic Church being erected at South Cliff.

Worksop.—The U.D.C. has accepted the following tenders :—

Jas. Oakes & Co.—Steam, exhaust and circulating water-pipes, £78.
Willans & Robinson, Ltd.—Force pump for condensing plant, £48.
E. Bennis & Co., Ltd.—Mechanical stoker, £127.
Matthews & Yates, Ltd.—Ventilating fan, £24.
India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.—Rubber Insulated cable, £44.
British Insulated and Helsby Cables, Ltd.—Feeder pillar and joint boxes, £41.
Venner & Co.—Switchboard meters, £41.

NOTES.

Municipal Tramways Association (Inc.).—The eleventh annual conference of this Association is to be held at West Ham on September 25th, 26th and 27th. Mr. H. E. Blain, manager of the Corporation tramways there, is the president. Mr. C. J. Spencer, of Bradford, is the hon. secretary and treasurer. The programme, a copy of which is before us, shows that there is to be an informal musical conversazione at De Keyser's Hotel at 8 p.m. on Tuesday, September 24th, and the proceedings begin the following morning at 10.15 o'clock with a reception by the Mayor and the Tramways Committee at the Town Hall, Stratford, followed by Mr. Blain's presidential address and a paper on "Tramway Administration by Municipalities; a Retrospect and a Forecast," by Councillor S. C. T. Neumann, deputy-chairman of the Bradford Tramways Committee. Councillor C. Higham, vice-chairman of the Blackburn Tramway Committee, will open the discussion. After luncheon at the Town Hall the Conference will proceed to the tramway depôt at Greengate Street, Plaistow, where a discussion, opened by Mr. C. A. King, M.Inst.C.E., will take place on the Interim Report of the Corrugation Committee. An inspection of the depôt, and of the exhibition of tramway appliances, &c., at 5.30 o'clock, and the Corporation reception at the Stratford Town Hall at 7.30, are other items in a very full day's programme. On Thursday, in the Town Hall at 10 a.m., Mr. W. J. McCombe, tramways manager at Hull, will read a paper on "Tramway Fares and their Basis," and Mr. F. Schofield, tramways manager, Leyton, will open the discussion. The Corporation luncheon, a meeting of the managers' section, inspection of the depôt and exhibition, a garden party in West Ham Park from 3 to 5 p.m., and the Association dinner at the G.E.R. Hotel, Liverpool Street, at 7 for 7.30 p.m., will complete the programme for the Thursday. On Friday the annual business meeting will take place at De Keyser's Hotel at 9.45 a.m., and a motor-coach excursion to Epping Forest and Rye House will begin at 11 a.m. With such a programme the Convention bids fair to be a great success.

Bailiffs in Newcastle-on-Tyne Tramway Offices.—At a meeting of the Newcastle City Council, on the 15th inst., in reply to a question, Councillor Rodgers, the chairman of the Tramways Committee, made an explanatory statement as to the Sheriff's officer having been "in possession" at the tramway offices, on July 17th, following the compensation claim of Garland *v.* The Corporation.

Wayleaves for Overhead Mains.—The Prussian Ministers of Commerce and Public Works have just issued an order to the Government officials for guidance in regard to the relations between undertakers of central power stations and the communal authorities or combinations of these authorities. It is pointed out in the first place that in the arrangements made for the use of public roads, streets, &c., for mains, transformers, &c., the local authorities frequently undertake to grant a similar right to no other undertaker during a definite period. In this the Ministers see a great danger, as difficulties might arise therefrom later on which could not be overcome or only be surmounted at a considerable sacrifice. It is also impossible to foresee the future development of electrical supply, especially as the cost of production in general shows a falling tendency. It is therefore not advisable for the local authorities to deprive themselves of the possibility of availing themselves on a given opportunity of the advantages which can be offered by competition, particularly as they are also at liberty, without entering into an exclusive rights agreement, to take into account the interests of an existing undertaking by refusing temporarily to others the right of way over the streets, roads, &c., for the transmission of energy. Where the population is dense and the degree of economic development of the area of supply is great, the Ministers express the opinion that the success of the undertaking is also assured without the possession of the exclusive rights. If the grant of such a right cannot be avoided, it is submitted that it should in any case only be given for a short period.

High-Frequency Generators.—A company is to be formed in Paris early in September, to undertake the international working of the foreign patents for the Goldschmidt high-frequency generator, excluding those for Germany which are held by the Lorenz Telegraph Co., whilst the High-Frequency Machine Co., of Berlin, owns the foreign patents. French, German and American industrial and banking interests will participate in the new company, which will have an ordinary share capital of £400,000, 25 per cent. paid, and 100,000 non-redeemable deferred shares, which will be entitled to 45 per cent. of the profits remaining after a dividend of 6 per cent. has been paid on the ordinary shares. The High-Frequency Co. will receive for its patents one-half of the deferred shares and £100,000 in cash, and will also take over £100,000 in ordinary shares, upon which 25 per cent. will be paid. It is proposed to establish an experimental wireless service between the United States and Germany, and the new company will undertake the construction of a large tower near New York, whilst the tower now being erected near Hanover will remain in the hands of the German company. It is stated that the decision to form a foreign company for the working of the patents is prompted by the circumstance that a German company would not be specially suitable for negotiating with Government authorities in many countries.

Copper.—Statistics of copper supplies, as shown by Messrs. Merton's circular for August 15th, 1912, show that at present the balance is fairly well maintained. The visible supplies at mid-month stand at 46,071 tons, as against 44,996 tons for the end of July. Including Rotterdam and Hamburg, the figures are 51,234 tons, as against 50,574. We find that stocks in English ports have increased 561 tons in the fortnight; stocks at Havre, 1,064 tons; the quantity afloat from Chile is 150 tons more than for the end of July. On the other hand, the Australian consignments are 700 tons lower, the stocks in Rotterdam, 200 tons down, and stocks in Hamburg, 215 tons less. The same tone appears in American stocks, these standing at 22,446 tons for the end of July, as against 19,793 for the end of June. The world's supplies for the end of July were 73,020 tons, against 67,931 for end of June. This is the first time the supplies have shown a decided increase over a previous month since last September.

Turning to European supplies and deliveries, we find that the arrivals from North America are rather low, while the supply to England and France from Spain and Portugal is exceptionally high (1,866 tons for the half-month). Shipments from Chile work out at above average, and the same from Australia. Deliveries, however, are not very brisk, and the revival of trade to be anticipated from more settled financial conditions will probably considerably affect the present relations of supply and demand.

Summing up the general outlook, a writer in the *Financial Times* for August 20th points out that the real underlying factor in the market is the enormous growth in the world's consumption of the metal, which has been going on for a considerable time. He further says :—"During the past two years consumption has been steadily overtaking production." Practically the whole of the increase has occurred in Europe, the American consumption having shown no improvement until within the last month or two. The principal increase has been witnessed in Germany, and a table is given from one published by Messrs. James Lewis & Son, stating the figures as far as available for this year as compared with the same periods in the two previous years :—

	1910. Tons fine.	1911. Tons fine.	1912. Tons fine.
England (7 months)... ...	46,163	54,449	48,928
France (7 months)	32,587	42,913	45,857
Germany (6 months) ...	77,447	85,188	109,727
Other countries (7 months)	16,939	18,919	23,567

The decrease this year in the consumption of England, as compared with that of 1911, is to be attributed to the coal strike and other labour difficulties. According to this article, trade in the United States is improving. Supplies are not increasing in pace with the consumption; the new properties opened up as a result of the rise in 1906 have not, so far, had so much influence in this direction as was expected.

Institution and Lecture Notes.—Iron and Steel Institute.—At the Autumn meeting, which is to be held at Leeds from September 30th to October 4th inclusive, 18 papers are to be read, including the following :—

"On a New Type and Method of Construction of Large Gas Engines." By A. E. L. Chorlton (Manchester).

"On the Thermal-Magnetic Transformations of 25 per cent. Nickel Steel." By Dr. E. Colver-Glauert (Sheffield) and Dr. S. Hilpert (Charlottenburg).

"On a new Method for the Improvement of the Soundness of Steel Ingots by the Aid of Thermit." By Dr. Hans Goldschmidt (Essen/Ruhr).

"On a Method of Producing Sound Ingots." By Sir Robert A. Hadfield, F.R.S. (Sheffield).

"On a New Method of Revealing Segregation in Steel Ingots." By Sir Robert A. Hadfield, F.R.S. (Sheffield).

"On the Magnetic Properties of Manganese and Nickel Steels." By Dr. S. Hilpert (Charlottenburg), and Dr. W. Mathesius (Worcester, Mass., U.S.A.).

"On Some Aspects of Wire Drawing." By P. Longmuir (Sheffield).

"On Rolling-Mill Practice in the United States." By J. Puppe D. Ing. (Breslau).

Visits to a large number of works, including those of Kitson and Co., Ltd., J. Fowler & Co., Ltd., J. Buckton & Co., Ltd., Hathorn, Davey & Co., Ltd., Hunslet Engine Co., Ltd., Manning, Wardle and Co., Hudswell, Clarke & Co., Ltd., J. and H. McLaren, Walter Scott, Ltd., Coghlan Steel and Iron Co., Ltd., Monk Bridge Iron and Steel Co., the Leeds city lighting and tramway power stations, Farnley Iron Co., Ltd., Greenwood & Batley, Ltd., W. Johnson & Sons, Ltd., Fairnbairn, Lawson, Coombe & Barbour, Ltd., Otto Coke-Oven Co., Ltd., Taylor Bros. & Co., Ltd., Yorkshire Copper Works, Hunslet, Thos. Smith & Sons, Rodley, Wilson Hartnell & Co., Ltd., Leeds Railless traction system, and many other works of engineering and industrial interest. There will also be visits to Bolton Abbey, Fountains Abbey, and North Lincolnshire and Immingham.

Explosions on Tramcars.—On the 16th inst., at St. Helens, Michael Thomas, 20, Bond Street, Prescot, was summoned for travelling on a car of the St. Helens Tramways Co., having in his possession a certain explosion, ammonite. Mr. Kelly, who prosecuted, said that on July 18th last a number of colliers, contrary to the by-laws, left in a car, at Prescot, a tin box containing a number of ammonite cartridges, which was a dangerous explosive. Had an accident occurred there might have been a most serious explosion. Defendant was fined 40s., and ordered to pay the advocate's fee and the expert witness's fee.

Inquiries.—A correspondent asks for the names and addresses of dealers in drawn tungsten wire.

Electrical Engineers in Camp at Weymouth.—On Saturday last the members of the Dorset Fortress Electric Light Co., R.E., took to canvas on the Nothe, Weymouth, for their annual training. The company paraded at the Sidney Hall in the afternoon, and marched to the Nothe Common, where for the following fortnight important operations in electric lighting and engineering will be entered upon.

Will.—Mr. Robert Douglas Norman, of Glasgow, and formerly of Edinburgh, electrical engineer, who went down in the *Titanic* disaster, left personal estate in the United Kingdom valued at £5,973, of which £1,190 is in Scotland.

The Shops Act.—At the Burnley Police Court last Friday, Mr. James Batty, electrician of Market Street, was summoned for failing to affix in his shop the specified notice intimating the day of the week on which assistants are not employed after half-past one o'clock. On behalf of the Corporation, who prosecuted, Mr. Gray stated the Act had been in force three months and there were shopkeepers who either did not or would not take any notice of its requirements. Mr. Batty said he had a notice in his shop window, but Sergt. Ratcliffe stated, that it was not the one required, as it referred to the closing of the shop only. Mr. Batty : I received no warning. The Magistrate's Clerk : Ignorance is no excuse. You must have a notice in the prescribed form. Mr. Batty being willing to affix the notice, he was let off on payment of costs, no conviction being recorded.

Appointments Vacant.—Lecturer and instructor in dynamo design (£250), also a junior assistant in electrical engineering (£100), for the City and Guilds Engineering College, Exhibition Road ; meter tester for D.C. work, at Birmingham Corporation electricity supply department (30s.). See our advertisement pages to-day.

Annual Excursion.—On Saturday, August 17th, well over 300 of Messrs. A. Reyrolle & Co.'s employés travelled by special train to Redcar, where a most enjoyable day was spent. Sports were held on the sands in the morning, and lunch and tea were served in the Cleveland Hall, where speeches were made by various members of the staff, commenting on the success of the firm, at whose excursion, some 20 years ago, only 11 members were present.

Educational Notes.—The University of Liverpool (Faculty of Engineering).—Particulars of the professors and lecturers in electrical and other engineering subjects for the 1912-13 session, which opens on Thursday, October 3rd, are given in an announcement which appears in our advertisement pages to-day.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. H. P. Baynham, assistant electrical engineer at Whitehaven electricity works, has been appointed to the post of works superintendent at the Carlisle Electricity Works, and on Friday last he was presented with an electroplated tea service and tray. The presentation was made by the chairman of the Electricity Committee (Alderman J. R. Musgrave), supported by the vice-chairman. The borough electrical engineer (Mr. B. Sankey) expressed his regret at losing Mr. Baynham, who had been associated with him for the past eight years.

Mr. C. R. Marshall, of the Grays U.D.C. Electricity Department, has been appointed charge engineer at the St. Albans power house, of the North Metropolitan Electric Power Supply Co. On leaving Grays he was presented with a gold-mounted fountain pen.

Mr. W. Mayall Milnes, assistant electrical engineer at Burnley, has been appointed chief mechanical and electrical engineer to the tramways department, Coventry. There were 250 applicants, and Mr. Milnes will take up his new duties a month hence.

Tramway Officials.—Mr. Geo. Hosking, late senior inspector of the Plymouth, Stonehouse, and Devonport Tramways Co., has been presented by the directors, in recognition of 30 years' service, with an upholstered armchair.

General.—A Dublin newspaper referring to Mr. Sowter's recovery after his serious accident at Bray, says : "After the occurrence Mr. Sowter displayed the greatest fortitude, and actually dictated his will while he lay in a mangled condition prostrate on the earthen floor of the works. He retained consciousness, though he suffered considerable pain, while being conveyed from Bray to St. Vincent's Hospital, Dublin, in a motor-car. In this institution a very successful operation was performed upon him by Surgeon Kennedy, and his rapid recovery has been looked upon as marvellous by the medical staff connected with the hospital. One evening last week, accompanied by Surgeon Kennedy, Mr. Sowter was removed from the hospital and driven in a motor-car to his residence, where he was received with delight by his wife and young family. It is understood that when Mr. Sowter regains his old strength he will continue to manage the electric light works of the 'Brighton' of Ireland."

On August 8th Mr. J. Rodgers, assistant engineer at the Government Electricity Works, Malta, was presented by Mr. Muller, chief engineer, on behalf of the staff, with a silver cigarette case, on the occasion of his leaving to take up a similar position in England.

Mr. Stanley J. Goddard, President of the Constantinople Telephone Co. (Société Anonyme Ottomane des Téléphones de Constantinople), and Mr. W. W. Cook, consulting engineer, left London by the Orient Express on Saturday, 24th inst., on a visit to Constantinople.

Obituary.—An Exeter paper reports the death, at the early age of 49 years, of Mr. Frank Golding, electrical engineer at the Devon County Asylum.

According to news received by the *Western Daily Mercury*, at Plymouth, the death has occurred of Mr. C. O'Brien Shaw, chief electrician of the Eastern Telegraph Co.'s steamship *Electra*, at Zanzibar. Deceased, prior to going abroad, was electrician of the ss. *John Pender*, the E.T.C.'s depôt ship, which has moorings in Stonehouse Pool. Mr. Shaw was the son of the late Capt. Sir E. Massey Shaw, K.C.B.

The *Morning Post*, in referring to the death of Capt. Arthur William Stiffe, suddenly, at Goring-on-Thames, at the age of 81 years, says that in 1862 he was employed on special survey duty for the laying of telegraph cables in the Persian Gulf. The following year he was on special duty in Turkish Arabia, and in October was appointed engineer of the Persian Gulf Telegraphs, and to the command of the *Amberwitch*. Capt. Stiffe was afterwards officiating Director of the Telegraphs and Port Officer of Calcutta. He was a member of the Institution of Electrical Engineers. In 1890 Capt. Stiffe was engineer-in-chief of the Halifax-Bermuda Cable Expedition.

According to the *Times* "Deaths" announcements, Mr. Walter A. R. Knight, A.I.E.E., superintendent of Eastern Extension Telegraph Co. at Cape St. James, Saigon, passed away in London on 9th inst., at the age of 41 years.

NEW COMPANIES REGISTERED.

Albert Green, Ltd. (123,688)—This company was registered on August 10th, with a capital of £16,000 in £1 shares, to carry on the business of wire covering, gimp, cord, braid, tassel, tape, trimming, elastic, electric cable and wire manufacturers, &c., to acquire the business carried on by A. Green at New Normanton Mills and Agar Street, Derby, and Wirksworth, Derbyshire, and elsewhere. The subscribers (with one share each) are :—A. Green, 48, Derby Lane, Derby, trimming manufacturer; T. Walton, The Bank House, Normanton Road, Derby, bank manager. Private company. The number of directors is not to be less than two or more than five ; the first are A. Green (chairman), and others to be appointed by him ; qualification, 100 shares. Registered office, New Normanton Mills, Derby.

Argentine Tramways and Power Co., Ltd. (123,780).—Registered August 15th, by Budd, Johnson & Jecks, 24, Austin Friars, E.C. Capital, £500,000 in £5 shares. Objects:—To acquire the benefit of any concessions, grants, decrees, rights, powers and privileges which may be granted by any municipal or other authority, and particularly those relating to the construction or working of electric tramway lines, power station, railway lines, or other public works, and to undertake and carry out the same or any part thereof; to acquire or construct, equip and work tramways, railways, waterworks, factories, and public or private buildings and works; to carry on the business of an electric light, power, and supply company, &c. The signatories (with one share each) are:—E. Porter, 33, Newman Road, Plaistow, E., clerk; H. S. Lewis, 33, Waverley Road, South Woodford, accountant; W. H. Jackson, 35, Park Hall Road, East Finchley, N., accountant; A. S. Jecks, 24, Austin Friars, E.C., solicitor; G. A. May, 34, Stamford Hill, N., clerk; G. P. Pleasance, 8, Tintern Road, Wood Green, N., clerk; R. Cave, 26, Beversbrook Road, Tufnell Park, N., clerk. Registered without articles of association. A letter from the solicitors states that "there are no directors of the company who have consented to act."

Rushden and District Electric Supply Co., Ltd. (123,683).—This company was registered on August 9th, with a capital of £25,000 in £1 shares, to take a transfer of the undertaking authorised by the Rushden and District Electric Lighting Order, 1912, to produce and supply electrical energy within the limits of supply prescribed by the said order and any orders amending or extending the same, to carry on the business of suppliers of electric light and power, electrical engineers, metal workers, contractors for the supply of electrical plant, &c., and to adopt an agreement with F. H. Thornton, B. Sampson and J. Clark. The subscribers (with one share each) are:—F. H. Thornton, Kingsthorpe Hall, Northampton, gentleman; W. James, 31, Billing Road, Northampton, gentleman; E. M. Browne, 21, The Drive, Northampton, solicitor; G. H. Jackson, 22, The Crescent, Northampton, engineer; E. W. Sykes, 53, Colwyn Road, Northampton, gentleman; B. Sampson, 32, Market Square, Northampton, gentleman; H. St. J. Browne, 21, The Drive, Northampton, solicitor. Private company. The number of directors is not to be less than three or more than seven; the first are F. H. Thornton, B. Sampson and J. Clark; qualification, £200; remuneration, £60 per annum divisible. Solicitors, Browne & Wells, Northampton. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

Bourton-on-the-Water Electric Light and Power Co., Ltd. (123,629).—This company was registered on August 7th with a capital of £1,250 in £1 shares, to carry on the business of an electric power, light and supply company in all its branches, electricians, mechanical engineers and suppliers of electricity, &c. The subscribers (with one share each) are:—L. E. Jones, Orchardleigh, Pinner, Middlesex, gentleman; S. T. Bacon, 60, Cumberland Road, Acton, W., clerk; W. G. C. Masham, 54, New Broad Street, E.C., secretary; H. M. Andrews, 54, New Broad Street, E.C.; G. F. Moore, J.P., Chardwar, Bourton-on-the-Water; G. L. Hartwell, Bourton-on-the-Water, ironmonger; J. A. Bloss, Bourton-on-the-Water, auctioneer. Minimum cash subscription, 100 shares. The number of directors is not to be less than two or more than five; the first are H. T. Harrison and W. Riggs; qualification (except first directors), £50. Solicitor, T. F. Bowman, 62, London Wall, E.C.

Marro Manufacturing Co., Ltd. (123,745).—This company was registered on August 14th, with a capital of £2,000 in £1 shares, to carry on the business of manufacturers of and dealers in lamps, mantles, burners, films, globes, brackets, shades, glasses, galvanometers, ammeters, voltmeters, carbons, switches, motors, batteries, stores, turbines, pipes, wires and appliances used in connection with gas, electricity or other illuminant or generator of heat, light or power, asbestos packing and rubber for machinery belt dressing, solvents and articles of rubber, or in which rubber is or may be incorporated, &c., and to adopt an agreement with C. Salomon and S. Salomon. The subscribers (with one share each) are:—C. H. Busch, 12, Curzon Road, Muswell Hill, N., secretary; S. Salomon, 39, St. John's Lane, E.C., director. Private company. The first directors are C. Salomon, S. Salomon, C. Krecke and C. H. Busch. Remuneration £10 each per annum. Registered office, 39, St. John's Lane, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—A memorandum of satisfaction in full on various dates ending January 1st, 1912, of first debentures, created October 3rd, 1901, securing £250,000 and second debentures, dated from January 31st, 1907, to November 3rd, 1908, securing £150,000, has been filed.

Venner Time Switches, Ltd.—A memorandum of satisfaction to the extent of £500 on July 1st, 1912, of debenture, dated July 10th, 1911, securing £5,000, has been filed.

West African Telegraph Co., Ltd. (21,626).—Return dated May 29th, filed June 4th, 1912. Capital, £100,000 in £10 shares; 13,109 shares taken up; £231,090 paid. Mortgages and charges: Nil.

W. Lucy & Co., Ltd. (51,908).—Return dated June 1st, filed June 15th, 1912. Capital, £15,000 in £10 shares (250 preference and 1,250 ordinary); 1,030 ordinary and 250 preference shares taken up; £10 per share called up on 781 ordinary and 250 preference; £10,310 paid; £2,490 considered as paid on 249 ordinary. Mortgages and charges: £7,000.

International P.A.Y.E. Tramcar Co., Ltd. (1,178F.)—Particulars filed July 31st, 1912; capital, $3,750,000 in $5 shares. Registered in Canada on November 15th, 1911. British address, 6, Broad Street Place, E.C., where H. M. Howard is authorised to accept service. Directors: Rt. Hon. Earl Clanwilliam, Sir Francis Lowe, M.P., C. Steel, H. J. Buckmaster, D. McDonald, R. L. Macduffie and L. C. Huppert.

Northern Counties Electricity Supply, Ltd. (67,924).—Return dated June 21st, filed June 26th, 1912. Capital £200,000 in £1 shares. 149,990 shares taken up. £1 per share called up on 145,990. £145,951 5s. paid, including £1 5s. paid on 10 shares forfeited. £4,000 considered as paid on 4,000 shares. Mortgages and charges: £190,000.

Wolverhampton District Electric Tramways, Ltd. (68,345).—Return dated May 16th, filed June 3rd, 1912. Capital, £80,000 in £5 shares. 32,200 shares taken up. £5 per share called up on 31,950 and 5s. per share on 250. £ 59,812 10s. paid. Mortgages and charges: £89,000.

W. A. Meadows & Co., Ltd.—Bond and debenture by way of indemnity and security, dated July 31st, 1912, to secure £608, charged on company's property and undertaking, including uncalled capital. Holder: J. Boulton, Hanley, Staffs.

Midland Electric Manufacturing Co., Ltd.—Second mortgage debenture dated July 31st, 1912, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: F. H. Jordan and J. H. Prince, 4, Temple Row West, Birmingham.

Siemens Bros. Dynamo Works, Ltd. (88,928).—Return dated July 18th, filed July 23rd, 1912. Capital £80,000 in £10 shares. 20,000 shares taken up. £10 per share called up on seven. £70 paid. £199,930 considered as paid on 19,998. Mortgages and charges: £200,000.

Telegraph Condenser Co., Ltd. (110,048).—Return dated January 10th (filed August 14th), 1912. Capital £5,000 in £1 shares. 2,000 shares taken up. £2,000 considered as paid. Mortgages and charges: Nil.

Veritys, Ltd. (49,784).—Return dated July 15th, 1912. Capital, £210,000 in 7,000 5 per cent. first preference, 7,000 6 per cent. second preference and 6,980 ordinary shares of £10 each and 200 management shares of £1 each. 7,000 first preference, 7,000 second preference, 6,630 ordinary and 200 management shares taken up. £1 per share called up on 30 management and £10 per share on 4,670 first preference, 7,000 second preference and 2,480 ordinary. £141,030 paid. £65,470 considered as paid on 170 management, 2,330 first preference and 4,200 ordinary. Mortgages and charges: £60,000.

Banbury and District Electric Supply Co., Ltd. (65,746).—Return dated June 11th, filed July 30th, 1912. Capital, £25,000 in £10 shares. All shares taken up. £25,000 paid. Mortgages and charges: £1,000.

Industrial Plant Co., Ltd.—Issue on July 26th, of £1,000, and on July 27th, 1912, of £200 debentures, parts of a series of which particulars have already been filed.

Guildford Electricity Supply Co., Ltd.—Particulars of £15,000 second mortgage debentures, created July 12th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £10,000. Property charged: The company's undertaking and property, present and future, including uncalled capital, subject to £25,000 first mortgage debentures. No trustees.

Campbell & Isherwood, Ltd. (97,971).—Particulars of £5,000 debentures, created July 18th, 1912, and secured by trust deed of even date, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, except uncalled capital, but including electrical works in Raleigh Street, Bootle, Lancs. Trustees: J. W. Davidson, 6, Castle Street, and J. Tattersall, 53, Lord Street, Liverpool.

A memorandum of satisfaction in full on July 29th, 1912, of charge dated October 13th, 1911, securing all moneys due or to become due from the company to bankers, has been filed.

W. A. Stevens, Ltd.—Particulars of £5,000 debentures, created July 22nd, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Hill, Harding & Co., Ltd.—Issue on July 24th, 1912, of £200 debentures, part of a series of which particulars have already been filed.

Camborne Electricity Supply Co., Ltd. (57,950).—Return, dated June 13th, filed June 20th, 1912. Capital, £10,000, in £1 shares. 607 shares taken up. £605 paid, leaving £2 in arrears. Mortgages and charges: Nil.

British Westinghouse Electric and Manufacturing Co., Ltd. (62,919).—Return, dated May 23rd, filed August 2nd, 1912. Capital, £1,875,000, in 500,000 preference shares of £3 each and 75,000 ordinary shares of £5 each. All shares taken up. £1,500,000 paid on the preference. £375,000 considered as paid on the ordinary. Mortgages and charges: £1,468,853.

Trafford Power and Light Supply (1902), Ltd. (72,601).—Return dated June 25th, filed June 26th, 1912. Capital £80,920 in £1 shares (23,120 preference). 23,120 preference and 57,800 ordinary shares taken up. £80,920 paid. Mortgages and charges: £54,507 11s. 1d.

CITY NOTES.

Tyneside Tramways and Tramroads Co., Ltd.

THE directors' report for the half-year ending June 30th, 1912, states that the surplus of receipts over expenses is £4,970, which, with the balance brought forward of £373, makes a total to the credit of profit and loss account of £5,342, and after deducting interest on debentures, loans, &c., amounting to £1,014, there remains an available balance of £4,329. The directors propose payment of dividend on the preference shares (5 per cent. per annum, less income-tax), £601; dividend on the ordinary shares at the rate of 2½ per cent. per annum (less income-tax), £1,674; to the credit of reserve for renewals, depreciation, and other contingencies, £1,000 (this fund now amounts to £11,756); setting aside for the reduction of registration and formation expenses, &c., £330, and carrying forward £724. The traffic receipts show an increase of £870, as compared with the corresponding period of last year.

The half-yearly meeting was held in Newcastle-on-Tyne on 20th inst., Dr. J. T. Merz in the chair.

The CHAIRMAN, in moving the adoption of the report, stated that the increase in traffic receipts was slightly more than last year. The £869 increase had been made up by increases of £832 on ordinary traffic and £121 on workmen's traffic, and against that there was falling off in the holiday traffic of £74, whereas last year they had to report an increase of £127 on that item. This was owing to the state of the weather. The principal portion of the increase was on the ordinary traffic. The car-miles run were 70,095 more than the corresponding half of last year, when he had to report a decrease of 582. The principal item came from the workmen's traffic. The company had carried 240,404 passengers more than in the corresponding half-year. The receipts per car-mile had been 9·288d., which was the maximum they had reached, as against 8·870d. last half-year, and 8·8d. some years ago. The expenses were going up slightly, being 6·014d. against 5·998d., and this to some extent was owing to the increased repairs to the cars and lines, which, so far, had been defrayed out of revenue. They had not called upon the reserve fund in dealing with such repairs. Since July 1st last there had been a falling off, the decrease amounting to £541, which was almost entirely due to the falling off in pleasure traffic, and the fact that last year there was a special increase as a consequence of the railway strike. There was nothing to alarm them, for they quite expected at the end of the half-year to be as well, if not better, off than last year, because the ordinary and workmen's traffic was still on the increase.

MR. G. E. HENDERSON seconded the report, which was adopted.

Liverpool Overhead Railway Co.

The half-yearly meeting was held on August 13th in the Law Association Rooms, Liverpool, Sir Wm. B. Forwood presiding.

The Chairman, in moving the adoption of the report (see Electrical Review, page 228), congratulated the shareholders upon the encouraging accounts before them. They were the more gratifying because the past half-year had been one of considerable anxiety and difficulty to all railways. The coal strike not only seriously disorganised traffic, but it added materially to the cost of all railway services, and as a result, most railway companies had had to reduce their dividend by 1 per cent. per annum, and so far as his researches went, the Overhead Railway was the only line which was able to recommend the payment of an increased dividend. It was the more gratifying as it was the best dividend they had paid during the past 10 years. A dividend of 2 per cent. per annum, however, could not be entirely satisfactory, but it was certainly a gratifying improvement, and they hoped it might prove the beginning of a better state of things. They must, however, not be too sanguine. Recent legislation in the coal trade had added considerably to the cost of fuel, and the lesson of the late strike imposed upon them the necessity of carrying reserve stocks of coal. The Labour unrest had not only added to the wages bill, but it created an element of uncertainty as to the future, and the Insurance Act still further increased working expenses. On the other hand, the growth in traffic made very satisfactory progress. They had carried during the half-year on the railway and tramway 5,871,000 passengers, which not only showed an increase over the same half last year of 478,000 passengers, but it nearly constituted a "record," being the largest number of passengers they had carried in any half-year since 1903, which was only slightly in excess of these figures. The increase had been mainly in workmen and third-class passengers, and in consequence, the earnings per passenger carried remained the same, 1·69d. per passenger. They were earning before the Liverpool Corporation opened its Dingle Tramway in 1898, 1·99d. per passenger, and when it opened its service to Seaforth in 1900 they were receiving 1·90d. per passenger. If they had earned this average upon the traffic of the past half-year they would have received an increased revenue of £4,612, but their fares had had to be reduced to meet the competition of the Corporation Tramways and the Lancashire and Yorkshire Railway. The total receipts had been £40,927 against £37,856 during the same period last year, being an increase of £3,071. On the other side the expenditure had also gone up by reason of the strike and the increase in coal and wages bill, and they had spent £28,313 as against £27,229 last year, an increase of £1,084. Under the circumstances they had done very well, and much credit was due to the general manager and his staff for their careful oversight over expenditure, and the watchfulness and ability they displayed during the coal strike. The proportion of expenditure to revenue was 64·7 per cent., the best result they had achieved in this half since 1900. They had placed, as usual, £1,500 to renewal account, which now amounted to £45,166. They had also £1,500 standing to the credit of contingent fund and £1,047 to the credit of insurance fund. Both of these accounts had been added to during the half-year. The maintenance of the structure and of rolling stock and electrical equipment had received careful attention, and they were in excellent condition. To fill the vacancy on the board they had elected Alderman Hyslop Maxwell. During the many lean years through which they had passed the directors had only taken £500 per annum out of the £800 placed at their disposal by the shareholders. With the advent of better times they proposed to reinstate the amount of their fees. The chairman said he could not close without congratulating the city upon the great improvement which had taken place in the trade of the port, for the traffic on their railway was the best barometer of their trade. At the same time, they could not place out of sight the increasing competition for our oversea trade, and it would require all the vigilance of the city and dock authorities to enable them to maintain their present prosperity, and it could only be done by continued efforts to make Liverpool the most convenient and economical port in the kingdom. Nothing contributed more to the economical and expeditious conduct of the trade of the port, and therefore to its prosperity, than the overhead railway. The Railway Companies' (Accounts and Returns) Act would call upon them to render their accounts in another form next year. It would also dispense with their holding two meetings in the year, but would permit of their paying an interim dividend, and following the course adopted by other railway companies, they would in future only hold their annual meeting in February.

Mr. H. C. Woodward seconded the motion, which was carried without comment.

Perth Electric Tramways, Ltd.

The annual meeting was held on Friday last at the London Chamber of Commerce, Oxford Court, E.C., Mr. Allen H. P. Stoneham presiding.

The Chairman, in proposing the adoption of the report (see Elec. Rev., page 266), said he was gratified to be able to record a good increase in receipts over last year, and even over those of the boom year of 1906, when they benefitted by the Exhibition held at Perth. He had always said that eventually they would make large profits, and had given reasons for the faith which was in him, and he was glad now to be able to congratulate himself and the shareholders that he was not mistaken. Even now, however, they must walk warily. At the meeting in 1906 he said that they ought to put aside £2,500 a year at least for depreciation. They had not since been able to live up to that good resolution, but this year they were setting aside £9,000 to reserve, which would make that fund up to the figure it would have been had they put aside the £2,500 a year as intended. The profits for the current year promised to be much greater than those of last year, but one could never be certain what might happen. Two years ago the disastrous strike of their workmen took place, which cost them some £7,000. Since then they had only narrowly missed two other strikes, and those had only been averted by substantial rises in wages. Even now the men were not satisfied, and they had appealed to the Federal Arbitration Court, and one could never tell what the result would be. There was only one certainty, which was that the company would have to obey the award if it gave the men an increase, and the men would certainly strike if it did not give them an increase. Politicians here were fond of quoting Australian methods as a panacea for strikes, but the Arbitration Act in Australia had been nothing but a means of hitting employers, without any possibility of enforcing its awards when against the men. That attitude of the men was one of the reasons why the directors had agreed, subject to the consent of the shareholders, to sell the undertaking. The present time, however, was not an advantageous one to discuss the proposed scale. The Bill for the purchase was now before Parliament. It had passed the Lower House and would, no doubt, pass the Upper Assembly in due course, and then receive the Royal Assent, but until then it would be most injudicious to publicly discuss the matter, for at present it was only a provisional contract. As soon as possible they would call a special meeting, at which full information would be given and full discussion invited. He would then tell the shareholders why they considered the sale desirable, notwithstanding that the company was just entering upon the great era of prosperity to which they had looked forward so long, and which the directors had worked so extremely hard to obtain. He could assure them that the company had really been directed from London. The board had had to devote weeks at a time to its affairs, and to conduct very delicate negotiations continuously for the last two years. They had also had to conduct numerous other lengthy negotiations when they were getting extensions, and had had to commit themselves to those extensions, knowing that they involved capital outlay without knowing where the capital was to come from. On several occasions they had had either to borrow the money for the requirements of the company or to guarantee loans from their bankers in order to carry to a successful issue some of the operations which they had entered into in the interests of the company. They had to do that at times when the credit of the company was not good, and when the company was at a critical stage of its career. At a later stage they would ask the shareholders to vote them something more substantial than mere thanks, and they would have no hesitation in doing so, because they knew that if they had not taken the course they did the company would not have been in the position it occupied to-day. They felt, therefore, they were fully and fairly entitled to some share of the profits now being earned as a result of the exertions they had made and the risks they had run.

Mr. Charles Wren seconded the motion.

Mr. Francis complained of the late period of the year in which the meeting was being held, and asked whether the delay was due to the negotiations with the Government as to the sale of the property. He also asked why the dividend was only 5 per cent., seeing that the earnings amounted to 14 per cent. Supposing the sale went through, he would like to know whether the cash reserves would be ear-marked for the benefit of the ordinary shareholders, or whether it was proposed to let the preference shareholders participate in the distribution.

Mr. Andrews also expressed himself as disappointed at the smallness of the dividend, having regard to the profits earned.

The Chairman, in reply, said the meeting was delayed because the directors had hoped that by now they would have been able to have taken the shareholders into their confidence, and to have explained the agreement for sale. With regard to the necessity of adding to the reserve fund, they must remember that the sale was not yet through, and they did not know for certain that it would take place. If it did not, they would want the present reserve fund and a good deal more besides, and, in the judgment of the directors, it would be exceedingly unwise to pay a larger dividend until they knew what the future was going to be. Should the deal go through, they would call a special meeting, at which the whole position would be placed before them. The question as to whether the cash reserve should be divided among both classes of shareholders, or simply among the ordinary, would be one for the shareholders themselves to decide, it was not a matter for the directors.

The report was then adopted.

Walter Scott, Ltd.—The report for the year ended June, 1912, states that the profits of the steel works, collieries, &c., amount to £55,552. The directors proposed to pay the dividend on the cumulative 6 per cent. preference shares for the year to June 30th, 1912, and carry forward £655. The profits of the past year are sufficient to provide for the payment of all arrears of dividend on the preference shares. According to an abstract of the report appearing in a financial daily, the steel works have been well and profitably employed during the year, with the exception of the period covered by the railway strike in August last year, and the national miners' strike in March and April this year; but the trade disturbances mentioned have very seriously affected the production at the collieries, and in a lesser degree the smaller departments of the business. The prospects for the current year, however, are much more hopeful, and in the absence of further labour troubles a fairly prosperous period appears to be in view.

Manaos Tramways and Light Co., Ltd.

The annual general meeting was held on Tuesday at the offices, 9, Cloak Lane, Cannon Street, E.C., Mr. W. C. Burton presiding.

The Chairman, in moving the adoption of the report (see Elec. Rev., page 267), said he would first like to explain the apparent discrepancy between the surplus for the year, as shown by the monthly statements published by the operating managers, and the surplus as shown by the report. The difference arose solely from the manner in which the accounts were made up for the final report. The gross earnings as shown by the revenue account were slightly higher than those shown by the monthly statements. The local auditors' report showed the total profits in Manaos transferred to London account at £41,301. Deducting from that the London expenses and the debenture interest—£18,338, there remained a surplus of £22,963, as compared with £22,367 shown by the monthly statements made up from cabled returns—a very close agreement. When the directors considered the accounts, they felt that with a comparatively new company such as that, a conservative policy should be pursued, and, therefore, they had made special provisions and transfers against the revenue account of a total of £6,645, bringing the net surplus down to £16,318. Those transfers consisted of certain doubtful items locally charged to capital; provision in full against certain local contingent liabilities; reserve against possible bad debts: the writing down of the valuation of stores, and the settlement of certain old accident claims occurring in previous years. All of those items instead of being paid for out of revenue might have been dealt with through the renewal and contingent reserve accounts, thus making a better apparent showing for the year, but requiring larger additions to the reserves out of this year's surplus. The revenue account showed that the gross tramway receipts had increased from £105,867 to £109,718: the gross lighting receipts from £33,594 to £35,602, and the total gross income from £139,938 to £147,290. The operating expenses had increased from £110,076 to £112,634, and the net earnings had increased from £29,862 to £34,656, or an increase of 16 per cent., while the ratio of operating expenses to gross receipts had further fallen from 78½ per cent. to 76½ per cent. That ratio was still undoubtedly high, but the experience of the last few months showed that the efforts they were making to reduce it were being effective. The capital expenditure during the year amounted to £7,171. That expenditure was largely due to the extensions necessary for increasing the number of public arc lamps and to meet the demands of new consumers in the private lighting department and other amounts in the various departments of the system, all of which tended to increase the earning power of the undertaking. Throughout the year under review general business in Manaos remained in an unsatisfactory condition owing to the continued comparatively low price of rubber, and he thought it was a matter of congratulation that notwithstanding that, they had been able to show increased receipts. They were hoping to add to the revenue by the sale of more electric power and were now negotiating contracts for the purpose. Taking their gross receipts as a guide, that business depression seemed to have culminated in May this year, and now the recovery which they had hoped to have seen earlier seemed to have commenced. The current year had not started in a very encouraging way, but the more recent returns showed improved results, particularly in a marked reduction of operating expenses, and he anticipated further improvements. The number of car-miles run during the year increased by nearly 10 per cent., and the number of passengers carried by 3 per cent. from which it could be seen that they could considerably increase their net earnings without materially increasing the operating expenses. In the lighting department the number of public arc lamps increased nearly 7 per cent., and the number of lamps for private lighting by 33 per cent. After providing for debenture interest, London office and other expenses, there remained a balance of £16,318, to which must be added £3,509 brought forward, making a total of £19,827. Out of that the directors had transferred to the contingencies and accident reserve £2,500, bringing that account up to £10,000; and to renewals reserve £5,000, making a total to the credit of that account of £15,000. That left a balance of £12,327, out of which they recommended the payment of a dividend of 3 per cent., carrying forward £3,327. On the returns as they came to them a higher dividend, perhaps 4 per cent., might have been recommended, but they believed in a thoroughly conservative policy, and in only commencing the dividend at a rate which was practically sure to be maintained and increased in the future.

Mr. G. M. Booth seconded the motion.

The Chairman, in reply to a shareholder, said there were no motor-omnibuses in Manaos, and the condition of the roads there was such that motor-'bus competition would be extremely difficult.

Mr. Cobbe drew attention to a circular which was sent out some months ago, and which, he said, made some very glowing statements as to the company's working, which statements did not appear to be borne out by the report. In the circular in question, dealing with the first nine months of the year under review, it was claimed that the company had made a net revenue, which amounted to 85 per cent. of the total revenue as given in the report. He would be glad to know if the circular was issued from the offices of the company, and if not, why it was not disowned in any way.

The Chairman, in reply, said that the circular was not sent out by the company or by the operating managers. He believed, however, that the figures it contained were correct in accordance with the published statements issued from the office. As to the first nine months showing a large percentage of the annual return, that was practically always the case with enterprises of that kind in the Amazon valley. By far the best months of the year were October, November and December, and the period in between February and September, inclusive, were their poorest months. It would not be at all unreasonable that 85 per cent. of the earnings for the year should come in the first nine months.

The report was adopted.

Paignton Electric Lighting and Power Co., Ltd.—The annual report of this company, to which brief reference was made last week, states that the supply of current to the Torquay Tramways Co. commenced on September 17th last. The Tramways Co. had requested the company to supply 250 kw. of electrical energy, instead of 130 kw. under the agreement. The latter quantity had been found totally inadequate for requirements. The additional plant to meet the demand would involve a capital expenditure of £1,500, but its provision would result in a working economy of about £200 to the company. The sale of electricity had increased during the year from £823 to £1,668. The destructor revealed a profit of £142 and the wiring department a profit of £239. The depreciation fund was now £962. The directors and auditors considered it sufficient for the plant, machinery and buildings, which had not yet been installed four years. During the 12 months the company had connected a further 46 consumers, representing 6,085 8-c.p. lamp equivalents. The total number of consumers was now 140, and the lamps numbered 10,308. New condensing plant had been installed at a cost of £1,200. The plant, it was estimated, would reduce the working expenses to the extent of £400 a year, and it had been found to entirely obviate the vibration. In 1908 the company started with eight customers. The receipts for the first half of the current year were in advance of those of the corresponding period of last year by 53 per cent.

Dublin and Lucan Electric Railway Co.—The directors' report, which was presented at the half-yearly meeting held yesterday, states that the gross receipts for the half-year from all sources amounted to £3,637, an increase of £182 on the corresponding period of 1911, whilst the expenditure decreased by £24. After providing for debenture interest there is an available balance of £1,120, out of which the directors recommend the payment of the usual half-yearly dividend on the 5 per cent. preference shares, which will absorb £475; that £200 be set aside for renewal of overhead wires; and that the balance of £445 be carried forward. The dividend warrants will be payable on September 15th.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be officially quoted:—

Newcastle and District Electric Lighting Co., Ltd.—£150,000 6 per cent. second mortgage debentures.

The Committee has ordered the undermentioned securities to be quoted in the Official List:—

American Telephone and Telegraph Co.—$25,000,000 additional Collateral Trust 4 per cent. bonds of $1,000 each, Nos. 28,001 to 53,000.

Aberdeen Suburban Tramways Co.—The report for the half-year shows profit earned £1,484, with a balance of £3,614 at credit of profit and loss account. It is proposed that the latter sum be applied in adding to credit of renewal and depreciation account, £2,000; payment of a dividend of 2½ per cent, £780; payment of directors' fees, £42; leaving to be carried forward, £791.

Crossley Brothers, Ltd.—According to the *Financial Times* the directors have issued a statement saying they regret that, owing to the dislocation of business caused by the serious strike in the company's works during the half-year and to the unsettled state of labour in general, they do not consider it advisable to pay an interim dividend on the ordinary shares. The preference dividend will be paid as usual.

W. T. Henley's Telegraph Works Co., Ltd.—The directors have declared an interim dividend on the preference shares at the rate of 4½ per cent. per annum, less income-tax, and on the ordinary shares at the rate of 10 per cent. per annum, free of income-tax, for the half-year ended June 30th last, both payable August 31st.

Metropolitan Electric Tramways, Ltd.—At an extraordinary meeting held on 14th inst., Mr. E. Garcke presiding, the resolutions already approved relating to deferred shares, were confirmed.

Northampton Electric Light and Power Co., Ltd.—The directors announce an interim dividend of 5 per cent. per annum, less income-tax, on the ordinary shares for the half-year.

STOCKS AND SHARES.

Tuesday Evening.

The daily purchases by the Government broker of substantial lines of Consols for the Sinking Fund continue to have their effect in keeping up the price of the Funds, and this affords a steady influence to markets in general. There is nothing more unsettling to the Stock Exchange than a persistent shrinkage in the price of Consols, for no other reasons than are patent to the general eye. With Consols on the mend, confidence is at least fortified, if not entirely restored.

Home Railways hardened up after having been flat. The fact that this week's traffics run against those of the worst part of the strike last year was naturally trotted out as a bullish argument, and no doubt it has its effect in rallying prices. The absence of business, however, acts in the other direction, so that the sagging process is started very easily just now. A good deal of attention has been paid to the Undergrounds, prices falling away materially at one time. For example, Metropolitans dropped 2 to 55, and Districts fell nearly as much to 39, though in each case there have been subsequent recoveries. City and South London Ordinary shed part of its last week's rise, but the Central London trio is good, sustained by expectations of the Liverpool Street extension traffics.

Dealings are fairly frequent in London United Tramways shares, but on balance the price is unchanged, and the Debenture stock shows a fall of 1. Possibly some of the holders are a little nervous as to the outcome of the rate war—as the Americans would call it—which has arisen between the L.C.C. trams and the omnibuses. British Electric Traction Preferred stocks both fell 1, but apart from these movements the market is uninteresting.

Most of the principal shares in the Electricity Supply list are now quoted *ex* their autumn dividends, and, taking the deductions into account, the actual changes are practically negligible. City of London Ordinary are still *cum* dividend, and the price has fallen a sovereign to 17½; while the Preference went back to the same extent, it being declared that the usual supporters of these shares were "out of town." Counties, however, continue strong, and the price has advanced to 11⅛.

We are able to state that negotiations are in progress in the City for the promotion of a company to deal with a new metal filament which, it is claimed, has various advantages over the threads already in use. To what extent the assertion is justified we have had no opportunity for testing; but it seems to stand to reason that in course of time improvements will be made upon the filaments at present in use. The supply companies are hardly likely to welcome anything which would have the effect of still further reducing the consumption of current; but as they adapted themselves to the altered conditions which the metal-filament lamp introduced, so, of course, will they take whatever steps are necessary when further developments occur.

Canadian and American issues are, for them, remarkably quiet. The market remains good, and Mexican Light and Power, for instance, rose 3 points to 97½, part at least of the buying coming from Germany and Switzerland. Montreal Light and Power has risen substantially, and various bonds in this section are ½ to 1 higher. Rio Trams at 150½ are a point lower, and here again the volume of business has fallen off a good deal from what it was before the holidays got into full swing. British Columbia Electric have gone ahead still further, the Deferred particularly being in demand upon statements of the excellent season in British Columbia and the expansion of business generally over there. The bad weather of the past fortnight in this country has done a good deal to keep Stock Exchange business more active than usual, for people have been staying in town, rather than go away, where they have been able to make arrangements to do so.

The Marconi Company last week issued a long circular dealing fully with its position and prospects, and dwelling more especially upon the likelihood of the agreement with the Government being duly confirmed when Parliament re-assembles after the recess. The immediate effect was to depress the price still further, but later on came swift punishment for the "bears," the price running up against them to 4⅞, from which it dwindled to 4⅝ sellers. This influenced the price of Canadian Marconis, which hardened to 23s. 9d., though later on it eased off again. Another feature this week has been a sharp jump in West India and Panama Telegraphs, where a rise of 10s. was established in a couple of days, the price holding the improvement. This is attributed to fresh buying orders from the Americans who had the deal in hand before, and who are said to be bent upon acquiring control previous to the opening of the Panama Canal. The market is a dangerous one for the ordinary investor, but for the bold speculator who does not mind the possibility of the price moving against him at first there are certainly attractions in these volatile shares.

National Telephone Deferred has also come to the fore again, and has followed up its improvement of last week with a gain of four points. West Coast of America shares are firmer, and rises have been secured by Monte Video Telephone Ordinary and United River Plate Telephone Ordinary. Both in the Eastern group and the Anglo-American division there is little going on, prices remaining steady.

In the manufacturing group, Babcock & Wilcox shares of both classes are ⅛ higher, and a considerable business in all Iron, Coal and Steel shares is being done in the provinces. The country exchanges have the best market, as a whole, for such descriptions, but dealers in London complain bitterly of the restrictive legislation of the Stock Exchange Committee as being responsible for the driving away of business from this section as well as from others. Callenders' shares picked up to five. India Rubbers hardened to 9¾, making a rise of 20s. in a fortnight. A good deal of quiet strength is displayed by the rubber share market. Raw rubber has crossed the five-shilling Rubicon, and the Mincing Lane people talk it still better, in consequence of which there has been a bear scramble amongst the active shares, while investors are picking up with quiet persistence a good many of the others in which there is not such a free market.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight.		No. of wks.	Total to date.		Route miles open.	
		£	£*		£	£*		Inc.
Aberdeen	Aug. 14	3,442	— 127	11	17,776	— 478	14·4	..
Ayr	„ 17	1 026	— 76	18	6,248	+ 108	8	..
†Bath	„ 7	1,287	— 41	32	28,314	+ 1,558	..	..
†Birkenhead	July 28	1,168	— 8	16	19,103	— 618	13·68	..
Birmingham Corp.	Aug. 10	20,933	+2,701	19	201,252	+49,749	57·17	..
Blackburn	„ 14	2,474	— 123	20	24,720	+ 295	14·62	..
Blackpool Corp.	„ 15	8,901	+ 263	..	37,656	+ 4,610	11·87	..
Blackpool-Fleetw'd	„ 17	4,927	— 726	6	11,711	— 868	8	..
Bournemouth	„ 14	5,484	— 118	19½	37,181	+ 579	21·95	..
Bradford	„ 17	11,476	— 920	20	113,855	— 2,232	56	1·2
Brighton	„ 18	3,444	+ 155	20	22,708	— 709	9·5	..
Bristol	„ 16	15,907	+ 7	..	225,748	+ 17,154	30·5	..
Brit. Elec. Trac. Co.								
Airdrie	„ 9	562	+ 130	32	9,343	+ 2,447	3·65	..
Barnsley	„ 9	368	— 15	„	5,469	— 294	..	..
Barrow	„ 9	994	— 2	„	12,117	+ 2,787	5·37	..
Devonport	„ 9	1,754	— 102	„	17,257	+ 1,691	8·85	..
Gateshead	„ 9	2,210	— 81	„	32,814	— 184	11·25	..
Gravesend	„ 9	569	— 76	„	6,568	— 198	6·5	..
Greenock	„ 9	1,783	+ 30	„	25,489	+ 2,777	7·25	..
Hartlepool	„ 9	746	— 84	„	8,317	— 2·3	6·72	..
Kidderminster	„ 9	457	— 31	„	3,867	+ 68	..	..
‡Leamington	„ 9	197	— 64	„	5,978	+ 396	..	..
Merthyr	„ 9	508	— 37	„	6,229	— 390	2·9	..
Metropolitan	„ 9	18,777	- 1,970	„	238,881	+ 8,216	22	..
Middleton	„ 9	755	— 33	„	10,658	— 47	8·5	..
Mid. Joint Com'tee	„ 9	8,151	+ 442	„	104,185	+ 4,581	..	..
Oldham—Ashton	„ 9	1,298	+ 47	„	19,167	+ 1,411	9·18	..
Peterborough	„ 9	349	— 15	„	4,168	+ 319	5·81	..
Potteries	„ 5	4,142	+ 157	„	60,017	— 1,565	29	..
Rothesay	„ 9	1,064	— 148	„	7,711	+ 251	2·75	..
Southport	„ 9	832	— 52	„	1,6 0	— 151	8·17	..
S. Metropolitan	„ 9	1,235	— 380	„	27 1 9	— 457	..	..
Swansea	„ 9	3,088	+ 73	„	86,794	- 60	12·5	..
Tynemouth	„ 9	582	— 288	„	7.750	— 693	3·75	..
Weston-s-Mare	„ 9	953	— 231	„	4,312	— 755	3	..
‡Worcester	„ 9	886	+ 14	„	9,261	— 52	5·75	..
Wrexham	„ 9	261	+ 7	„	3,736	+ 245	..	..
Yorks. Wool. Dist.	„ 9	2,169	— 77	„	24,4·7	+ 918	17	..
Miscellaneous	„ 9	596	— 54	„	7,309	+ 159	..	..
Burnley	„ 17	3,789	+ 77	..	..	..	11·78	..
Burton-on-Trent	„ 18	621	— 98	20	5,613	— 337	6·63	..
Bury	„ 18	2,646	— 635	20	26,678	— 646	22·5	..
†Cardiff	„ 3	2,545	+ 46	18	43,686	+ 2,877	17·35	..
Chatham and Dist.	„ 15	2,148	— 19	13	27,580	— 138	14·9s	..
Cork	„ 15	1,026	— 148	33	15,981	— 189	9·85	..
Croydon	„ 9	3,766	+ 4 9	19	35,854	— 6·9	11·6	·75
†Darlington	„ 10	238	— 4	19	4,104	+ 45	4·87	..
Darwen	„ 16	610	+ 22	20	5,652	+ 143	4·26	..
Dover	„ 10	670	— 108	19	4,917	— 350	4·7.	..
Dublin	„ 16	12,365	—1,803	..	41,576	— 9,911	54·25	..
East Ham	„ 17	2,184	— 108	20	21,429	— 415	7·87	..
†Exeter	July 26	357	— 65	17	5,663	— 410	6·5	..
Glasgow	Aug. 17	35,776	—3,226	..	20 ,691	— 1,783	98	..
Hastings	„ 15	3,189	— 114	..	..	..	19·3	..
Huddersfield	„ 17	4,184	— 219	20	40,261	+ 417	29·5	5
Hull	„ 17	6 006	+ 226	20	57 798	— 15	3·5	—1
Ilkeston	„ 14	254	— 44	20	2,103	— 6.6	..	..
†Ipswich	„ 10	686	— 79	19	9,005	+ 9	10·5	..
Kilmarnock	„ 17	498	— 22	13	2,302	— 233	4·25	..
Lancashire United	„ 14	3,074	— 105	..	45,6.7	— 208	39	..
Leeds	„ 10	15,792	+ 542	19	149 840	+ 4,913	112·5	..
Leicester	„ 17	5,219	— 76	33	83,107	+ 2,242	20	..
†Leith	„ 10	672	— 103	13	9,132	+ 33	8·72	..
Liverpool	„ 10	25,4:5	+ 224	32	381,298	- 12,141	117	1
‡L.C.C.	„ 7	68,710	— 5,963	..	761,401	—3 ,001	140 6	..
London United	„ 17	14,248	—2,811	33	2 0,' 51	—10,100	..	..
Lowestoft	„ 17	1,074	— 143	46	8,711	— 524	3·5	..
†Manchester	„ 13	17,0·1	+ 177	19	322.180	+ 12,321	105	..
Newcastle	„ 17	8,411	— 98	..	87,875	+ 232	31·3	..
†Newport	„ 3	738	+ 13	18	12,128	— 889	7·25	..
Oldham	„ 18	4 186	+ 958	21	48,068	+ 2,081	22	..
Pontypridd	„ 10	506	+ 45	19	7,'41	— 9.6	5·5	..
Portsmouth	„ 10	5 604	— 951	19	48,854	— 3,'18	16·75	..
Preston	„ 14	2,166	+ 448	20	16,184	+ 902	10	..
Rotherham	„ 14	1,602	+ 235	1 ½	14,114	+ 618	12	..
Salford	„ 12	9,165	— 7	19	98,249	+ 257	41	..
Sheffield	„ 18	13 580	+ 341	21	138,171	+ 2,705	40	..
Southampton	„ 14	2 981	— 198	19	25,406	+ 16	11	..
Southend-on-Sea	„ 14	2,980	+ 85	20	17,246	+ 1,940	7	..
†South Shields	„ 10	758	— 81	19	12,196	— 283	10·25	..
Tyneside	„ 14	1,769	— 124	7	3,116	— 242	11	..
Wallasey	„ 17	2,781	— 103	19	23 440	— 517	8·72	..
Walthamstow	„ 17	1,667	— 355	20	16,076	— 354	9	..
West Ham	„ 8	5 410	— 341	19½	50,434	— 1,778	16 4	1·2
Wolverhampton	„ 14	2,223	+ 43	20	20,337	+ 196	13·75	..
Cen. London Rly.	„ 17	8 485	+ 815	7	29,774	— 1,688	6·78	·46
City & S. Lon. Rly.	„ 18	5 687	— 64	7	.9 890	— 1,407	7·3	..
Dublin-Lucan Rly.	„ 16	558	— 17	7	1,125	— 114	7	..
G.N. and City Rly.	„ 17	2,478	— 19	7	9,558	+ 80	3·5	..
L'pool Overh'd Rly.	„ 18	3,695	+ 815	7	12,074	+ 1,215	6·6	..
Llandudno-Col. Bay	„ 16	2,008	+ 94	3?·5	10,581	+ 186	6·5	..
Lond. Elec. Ry. Co.	„ 17	22 850	+ 2,130	7	85 095	+ 2, 00	21·25	..
Mersey Railway	„ 17	3 659	— 498	7	13.615	+ 244	4·5	..
Metropolitan Rly.	„ 18	31.418	+ 2,640	7	117.679	+ 3,567	25·75	..
Met. District Rly.	„ 17	22 605	+ 2,288	7	88 678	+ 7,101	26	..
Anglo-Argentine	„ 19	95.674	—2,405	33	1,670,?98	+ 61 121	..	..
§Auckland	„ 2	15 353	2.154	5	21 818	+ 5,629	23·51	..
Bombay (B.E.T.)	July 18	5,765	+ 168	29	87,012	+ 4,718	..	..
§Brisbane	..	..	..	..	..	..	..	..
Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	Aug. 17	8,202	+ 888	..	..	..	..	..
Cape Electric T.Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	July	2,998	..	30	21,150	..	20·5	..
§Lisbon	..	..	..	..	..	..	..	..
Madras	Aug. 15	1,656	+ 148	33	24 791	+ 2,758	13·5	·6
§Montevideo	July	25 485	+ 3 423	9	268,857	+ 37,599	..	..
Perth (W.A.)	Aug. 9	1 812	+ 295	32	19,600	+ 2,473	29	..

* Compared with the corresponding period of 1911. † One week only.
‡ Includes horse, steam and other receipts. § One month.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Aug. 20th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord. ..	10	5½	5½	9⅜ — 10⅜xd	+ ¼	5 2 4
Do. 4½ % Pref.	10	4½	4½	8⅜ — 9⅜xd	..	4 13 4
Do. Second 6 % Pref. ..	10	6	6	10¼ — 10⅜xd	..	5 11 7
Do. 4½ % Deb. Stock	Stock	4½	4½	98 —100	..	4 10 0
Brompton & Kensington, Ord...	5	10	10†	8⅜ — 9 xd	..	5 11 1
Do. 7 % Cum. Pref.	5	7	7	7⅝ — 8⅛xd	..	4 6 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	97 —100	..	4 0 0
Charing Cross, West End & City	5	5	5	4⅜ — 4⅞xd	..	5 2 7
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜xd	..	4 17 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	8⅜ — 4½	..	5 6 0
Do. Do. 4 % Deb... ..	100	4	4	94 — 96	..	4 3 4
Chelsea, Ord.	5	5	5	4⅜ — 4⅞	..	5 2 7
Do. 4½ % Deb.	Stock	4½	4½	97 —100	..	4 10 0
City of London, Ord.	10	7	8	16½ — 18½	—1	4 6 6
Do. 6 % Cum. Pref.	10	6	6	12⅞ — 14	—1	4 5 9
Do. 5 % Deb.	Stock	5	5	118 —122	..	4 2 0
Do. 4½ % Second Deb. ..	100	4½	4½	99 —102	..	4 8 3
County of London, Ord...	10	5	6	11⅜ — 11⅞	+ ⅛	5 1 1
Do. 6 % Pref.	10	6	6	11⅞ — 12⅜	..	4 17 0
Do. 4½ % Deb.	Stock	4½	4½	106 —108	..	4 3 4
Do. 4½ % Second Deb. ..	Stock	4½	4½	100 —103	..	4 8 3
Edmundson's, Ord.	5	Nil	Nil	7/16 — 11/16	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	3/8 — 3½	..	Nil
Do. 4½ % First Mort. Deb. ..	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	4⅞ — 5¼	..	5 14 3
Do. 5 % Cum. Pref.	5	5	5	4⅞ — 5¼	..	4 15 3
Do. 4½ % First Deb.	100	4½	4½	92 — 95	..	4 14 9
Hove	5	9	9	7½ — 8	..	5 12 6
Kensington & Knightsbridge, Ord	5	9	9	7½ — 7⅝xd	..	5 18 0
Do. 4 % Deb.	Stock	4	4	90 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	78 — 82	..	5 9 9
London Electric, Ord.	3	2	2½	1⅜ — 1⅝	..	4 0 8
Do. 6 % Pref.	5	6	6	5 — 5¼	..	5 9 1
Do. 4 % First Mort. Deb. ..	Stock	4	4	90 — 93	..	4 6 0
Metropolitan	5	5	4	3⅝ — 3⅞xd	..	5 3 3
Do. 4½ % Cum. Pref. ..	5	4½	4½	4⅛ — 4⅜	..	4 17 4
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	99 —102	..	4 8 3
Do. 3½ % Mort. Deb... ..	Stock	3½	3½	86 — 88	..	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	97½ — 99½	..	4 10 6
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅜ — 4⅞	..	5 2 7
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	101 —104	+1	4 16 2
Notting Hill, 6 % Non-Cum. Pref.	10	..	6	10 — 11	..	5 9 1
Oxford	5	7½	7½	5¾ — 6⅜	..	5 13 9
St. James' and Pall Mall, Ord.	5	10	10	8 — 8⅜	..	5 14 3
Do. 7 % Pref.	5	7	7	6⅜ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	83 — 86	..	4 1 5
Smithfield Markets, Ord. ..	5	Nil	2	1⅜ — 1¾	..	..
South London, Ord.	4	5	5	3 — 3½	..	5 14 3
Do. 5 % First Mort. Deb. ..	100	5	5	98 —101	..	4 19 0
South Metropolitan, 7 % Pref...	1	7	7	1 1/16 — 1 3/16	..	5 17 8
Do. 4½ % First Deb. Stock ..	100	4½	4½	97 — 100	..	4 10 0
Urban, Ord...	£3	6	..	¾ — ⅞	..	..
Do. 5 % Cum. Pref.	5	5	2	2⅜ — 3	..	3 6 8
Do. 4½ % First Mort. Deb. ..	100	4½	4½	80½ — 83½	..	5 1 8
Westminster, Ord.	5	10	10	8⅛ — 8⅜xd	+ ⅛	5 14 8
Do. 4½ % Cum. Pref.	5	4½	4½	5 — 5⅜	..	4 3 0

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅜ — 5⅞	..	5 2 2
Calcutta, Ord.	5	8½	8½	7⅜ — 8	..	5 6 3
Do. 5 % Pref.	5	5	5	5 1/16 — 5 5/16	..	4 14 1
Calgary Power, 1st Mort. Bds.	100	5	5	96 — 98	..	5 2 0
Canadian Gen. El. Com. ..	$100	7	7†	114 —119	..	5 17 8
Do. 7 % Pref.	$100	7	7	120 —124	..	5 13 0
Cordoba Lt., Power and T., Ord.	1	3	3†	13/16 — 15/16	..	3 4 0
Do. 5 % Deb.	100	5	..	94 — 97	..	5 3 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	92 — 94	+1	6 7 8
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	81 — 84	..	5 19 1
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	99½ — 101½	+ ½	4 18 6
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/8 — 3/8	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	8 6 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	104 —106	..	4 14 4
Madras, Ord.	5	..	..	1 1/16 — 2 1/16	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102 —105	..	4 15 3
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	89 — 91	..	5 10 0
Mexican Lt. & Power, Common	$100	4	4	96 — 99	+3	4 0 10
Do. 7 % Cum. Pref.	$100	7	7	109 —112	..	6 5 0
Do. 5 % 1st Mort. Gold Bds.	..	5	5	96½ — 98½	..	5 1 6
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	88½ — 90½	..	5 10 6
Montreal, Lt., H. and Power ..	$100	7	8	242 —247	+6½	3 4 9
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5	39 — 42	..	11 18 2
River Plate, Ord.	Stock	10	10	240 —250	..	4 0 0
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	109 —114	..	5 5 3
Do. 5 % Deb. Stock	Do.	5	5	101 —103	..	4 17 1
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital ..	$100	4	5†	151 —156	—1	3 4 1
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	108 —110	..	4 11 0
Do. 4½ % Per. Deb.	Stock	4½	4½	104 —106	..	4 5 0
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	99½ —101½	..	4 8 8
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Victoria Falls Power, Pref. ..	1	Nil	11¾d.	1/32 — 1 1/32	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	105½ — 107½	..	5 11 7

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	4†	7½ — 7¾	..	5 3 3
Do. 5 % Deb. Red.	Stock	5	5	96½ — 98½	..	5 1 6
American Telep. & Teleg., Cap.	$100	8	8†	149 —151	..	5 6 0
Do. Collat. Trust	$1000	4	4	93⅝ — 95⅞	..	4 3 9
Anglo-American Telegraph ..	Stock	8¾	8	67⅛ — 69⅛	..	5 7 11
Do. 6 % Pref.	Do.	6	6	113 —114	..	5 5 8
Do. Def.	Do.	80/-	80/-	26½ — 26⅞	..	5 13 2
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102½ — 104½	..	4 16 2
Chili Telephone	5	7	..	7½ — 7⅞	..	4 10 4
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	88 — 95	+ ½	4 14 2
Cuba Telegraph	10	6	6†	9½ — 10½	..	5 14 3
Do. 10 % Pref.	10	10	10	16½ — 17½	..	5 14 3
Direct Spanish Telegraph, Ord.	5	4	4†	3½ — 3¾	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	7 — 7½	..	6 9 0
Direct United States Cable ..	10	4½	5	7⅜ — 7⅝	..	6 7 0
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	5†	128¼ — 131½	..	5 6 5
Do. 8½ % Pref. Stock.. ..	Do.	8½	8½	77⅛ — 79½	..	4 8 1
Do. 4 % Mort. Deb.	Do.	4	4	99½ — 101½	+1	3 18 10
Eastern Extension	10	7	5†	18 — 18½	..	5 3 8
Do. 4 % Deb.	Stock	4	4	98½ — 100½xd	+1½	3 19 7
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	97½ — 100½	+ ½	3 19 7
Globe Telegraph and Trust ..	10	5⅝	6†	11 — 11½	..	5 4 4
Do. 6 % Pref.	10	6	6	12½ — 13	..	4 12 4
Great Northern Telegraph ..	10	18	18	28½ — 29½	..	6 3 1
Indo-European Telegraph ..	25	18	5†	56 — 58	..	5 3 5
Mackay Companies Common ..	$100	5	5	90 — 94	..	5 6 5
Do. 4 % Cum. Pref.	$100	4	4	70 — 73	..	5 9 7
Marconi's Wireless Telegraph	1	5	20	4⅜ — 4⅝	+ ⅛	4 4 3
Do. 7 % Cum. Partic. Pref.	1	16	17	4 — 4¼	+1/16	4 0 2
Monte Video Telephone, Ord. ..	1	6	6	1 1/32 — 1 5/32	+1/32	5 6 3
Do. 5 % Pref.	1	5	5	1/8 — 1/4	..	6 6 8
National Telephone Def. ..	Stock	6	6	147 —149	+4	..
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	100 —101	..	4 9 1
Oriental Telep. and Elec. ..	1	8	8	1 3/32 — 1 7/32	..	4 6 9
Do. 6 % Cum. Pref.	1	6	6	1 5/32 — 1 3/32	..	4 18 5
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 9 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	3 18 5
Reuter's	8	5	5†	10¼ — 10⅜	..	3 14 5
Submarine Cables Trust ..	Cert.	6	6	127 —130	..	4 12 4
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99 —101	..	4 9 1
United River Plate Telephone	5	8	8	7¾ — 7⅞	+1/16	5 6 8
Do. 5 % Cum. Pref.	5	5	5	5¼ — 5½	..	4 10 11
West Coast of America	2½	2½	2½	1 1/16 — 1 1/32	+1/32	3 18 5
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	10	1½	⅜	3 — 3½	+ ⅛	..
Do. 6 % Cum. 1st Pref. ..	10	6	6	10¼ — 10⅝	..	5 11 7
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9¾ — 10¼	..	5 17 0
Do. 5 % Debs.	100	5	5	100½ — 102½	..	4 17 7
Western Telegraph, Ltd. ..	10	7	6†	12⅜ — 13⅝	..	5 4 8
Do. 4 % Deb.	Stock	4	4	87 — 89	+1	4 0 10
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	100 —103	..	4 7 5

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Aug. 20th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	$\frac{5}{16}$ — $\frac{11}{32}$	..	Nil
Do. 5 % Pref.	1	5	5	$\frac{15}{16}$ — 1	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	78 — 83	..	5 8 5
Brit. Elec. Trac., 6 % Pref.	100	..	..	11 — 13	..	..
Do. Do. Deferred	100	..	..	6 — 8	..	..
Do. Do. 6 % Cum. Pr'f.	100	..	6	89 — 92	—1	6 10 5
Do. 7 % Non-Cum. Pr'f.	100	..	..	38 — 41	—1	..
Do. 5 % Perp. Deb.	100	5	5	98 —101	+1	4 19 0
Do. 4½ % 2nd Deb.	100	4½	4½	80 — 84	..	5 7 2
Central London Railway, Ord.	100	8	8	74 — 76 xd	+ ½	3 19 0
Do. Pref.	100	4	4	80 — 82 xd	+1	4 17 7
Do. Def.	100	2	2	74 — 76	+1	2 12 8
Do. 4 % Deb.	100	4	4	99 —101	..	3 19 3
City & South London, Ord.	100	1½	1⅝	33½ — 34½	— ½	3 19 6
Do. 5 % Pref., 1891	100	5	5	106 —108	..	4 12 7
Do. Do. 1896	100	5	5	102 —104	..	4 16 2
Do. Do. 1901	100	5	5	102 —104	..	4 16 2
Do. Do. 1903	100	5	5	101 —103	..	4 17 1
Do. 4 % Deb.	100	4	4	99 —101	..	3 19 3
Dublin United Trams, 6 % Pref.	10	6	6	10½ — 11½	..	5 2 2
Great Northern & City, Pr'f. Ord	10	Nil	..	1⅞ — 2⅛	..	Nil
Hastings Trams, 6 % Pref.	1	Nil	6	$\frac{5}{8}$ — $\frac{3}{4}$	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	71 — 76	..	5 18 5
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2¼ — 2⅜	..	4 11 0
Do. 4 % Deb.	100	4	4	75 — 80	+2	5 0 0
Lancashire United, 5 % Deb.	100	5	5	81 — 83	..	6 0 6
London Elec. Railw'ys, 4 % Deb.	100	4	4	94 — 96	..	4 3 4
London United Trams, 5 % Pref.	10	Nil	..	4⅝ — 5⅜	..	..
Do. 4 % Deb.	100	4	4	72 — 76	—1	5 5 3
Metropolitan Railway Consol.	100	1⅝	1⅞	55⅜ — 56½ xd	— ¼	2 17 10
Do. Surplus Lands	100	2⅜	2⅜	64 — 66 xd	— ¾	4 3 4
Do. 3½ % Deb.	100	3½	3½	86 — 88	..	3 16 11
Do. 3½ % Pref.	100	3½	3½	85 — 87 xd	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86 xd	..	4 1 5
Metropolitan District Ord.	100	Nil	Nil	39⅜ — 40¼	— ¾	Nil
Do. 6 % Deb.	100	6	6	141 —143	..	4 4 0
Do. 4 % Deb.	100	4	4	94 — 96	..	4 3 4
Do. 4 % Prior Lien	100	4	4	99 —101	..	3 19 3
Do. 4½ % First Pref.	100	4½	4½	89 — 91 xd	..	4 19 0
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metropolitan Elec. Trams, Ord.	1	5½	6	1 — 1⅛	..	5 6 8
Do. Def.	1	Nil	..	$\frac{3}{16}$ — $\frac{1}{4}$	..	Nil
Do. 5 % Pref.	1	5	5	$\frac{13}{16}$ — $\frac{15}{16}$ xd	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	96 — 98	..	4 11 10
Do. 5 % Deb.	100	5	5	99 —102	+1	4 1 0
Potteries, Ord.	1	2	..	$\frac{5}{16}$ — $\frac{7}{16}$	..	..
Do. 5 % Pref.	1	5	5	$\frac{29}{32}$ — $\frac{31}{32}$ xd	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
South Metro. Trams, 6 % Pref.	1	6	..	$\frac{13}{16}$ — $\frac{15}{16}$	..	7 7 8
Do. 4 % Deb.	100	4	4	70 — 75	..	5 6 8
Underground Elec. Railways	10	..	..	4 — 4¼	..	Nil
Do. "A"	1/-	..	..	$\frac{3}{16}$ — $\frac{5}{16}$	..	..
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	1	1½†	90 — 92	+3	..
Yorkshire (West Riding), Ord.	5	Nil	..	½ — ⅝	..	Nil
Do. 6 % Pref.	5	Nil	3	2⅞ — 3⅛	..	4 9 0
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8 5

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½	5¼ — 5⅜	..	5 2 4
Do. 2nd Pref.	5	5	5⅜	4⅛ — 5⅜	..	5 6 0
Do. 4 % Deb.	100	4	4	93½ — 95	..	4 4 3
Do. 4½ % Deb.	100	4½	4½	99½ —101½	..	4 8 8
Do. 5 % Deb.	100	5	5	101 —103	..	4 16 2
Auckland Trams, 5 % Deb.	100	5	5	102 —104	..	4 14 4
Bombay Elec. S. & Trams, Pref.	10	6	6	11½ — 12	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	97 — 99	..	4 10 11
Do. 5 % 2nd Deb.	100	5	5	97 — 99	..	5 1 0
Brisbane Trams Invt., Ord.	5	8	8	7 — 7½	..	5 6 8
Do. 5 % Pref.	5	5	5	4¾ — 5⅛	..	4 15 8
Do. 4½ % Deb.	100	4½	4½	100½ —103½	..	4 7 0
B. Columbia Elec. Rly., Def.	100	8	8†	140 —145	+4	5 10 6
Do. Pref. Ord.	100	6	6	119 —124	+3	4 16 9
Do. 5 % Pref.	100	5	5	108 —111	+ ½	4 10 1
Do. 4½ % 1st Mort. Deb.	40	4½	4½	99½ —102½	..	4 7 10
Do. 4½ % Vancouver Deb.	100	4½	4½	103 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	102 —104	..	4 6 7
Calcutta Trams, Ord.	5	6	7	6½ — 6⅝	..	5 5 8
Do. 5 % Pref.	5	5	5	4⅛ — 5⅛	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 3
Cape Electric Trams	1	Nil	2½†	$\frac{3}{8}$ — $\frac{1}{2}$	..	..
City Buenos Aires Trams (1904)	5	5	5	5½ — 5⅞ xd	..	4 6 11
Do. 4 % Deb.	100	5	5	99 —102	..	4 18 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	95 — 99	..	5 1 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	..	$\frac{7}{16}$ — $\frac{9}{16}$	..	Nil
Do. 5 % A Deb.	100	5	5	86 — 91	..	5 10 0
Do. 6 % B Deb.	100	5	3	35½ — 43½	..	6 18 0
La Plata Elec. Trms, Ord.	1	..	..	$\frac{1}{16}$ — $\frac{3}{16}$	..	..
Do. Pref.	1	6	6	$\frac{15}{16}$ — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6	1 — 1⅛	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	93 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb.	100	5	5	100 —102	..	4 18 0
Manaos Trams & Lt., 1st Deb.	100	5	5	90 — 93	+1	5 7 6
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100½ —102½ xd	..	4 17 7
Mexico Trams Com.	$100	7	7	127 —130	..	5 7 8
Do. Gen. Con. 5 % Bonds	..	5	5	101 —103	..	4 17 1
Do. 6 % Bonds	100	6	6	104½ —104½	..	5 14 10
Para Elec. Rlys. & Lt., Ord.	5	10	10	7⅞ — 7⅞	+ ⅛	6 9 0
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	7 0 4
Do. 5 % 1st Deb.	100	5	5	100 —102	..	4 18 0
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	1⅛ — 1⅛	..	1 18 4
Do. 5 % 1st Deb.	100	5	5	99 —102	..	4 18 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5¼ — 5⅜	..	5 4 4
Do. 4½ % 1st Deb.	100	4½	4½	97 — 99	..	4 11 0
Rio de Janeiro Trams	$100	4½	5†	149 —152	—1	3 5 9
Do. 1st Mort. 5 % Bonds	..	5	5	103 —104	+ ¼	4 16 2
Do. 5 % Mort. Bonds	100	5	5	99½ —100⅜	..	4 19 8
Sao Paulo Tram, Lt. and P.	$100	10	10†	259 —264	—1	3 15 6
Do. 5 % 1st Deb.	$500	5	5	105 —107	..	4 13 6
Singapore Trams, 5 % Deb.	100	5	5	84 — 87	+1½	5 15 0
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	6	7	5⅝ — 6¼	+ ⅛	5 14 3
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	100 —103	..	4 17 1
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	104 —106	..	4 4 11

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	$\frac{5}{8}$ — $\frac{3}{4}$	..	8 0 0
Do. 6 % Pref.	1	9	6	$\frac{11}{16}$ — $\frac{13}{16}$	..	7 7 8
Babcock & Wilcox	1	26	28	24 — 25	+$\frac{1}{16}$	4 2 10
Do. Pref.	1	6	6	1$\frac{7}{16}$ — 1$\frac{15}{16}$	+$\frac{1}{16}$	3 16 10
British Aluminium, Ord.	1	..	..	$\frac{13}{16}$ — $\frac{15}{16}$	..	..
Do. 6 % Cum. Pref.	1	..	..	$\frac{7}{8}$ — $\frac{15}{16}$	..	..
Do. 5 % Prior Lien Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	84 — 87	..	5 15 0
B.I. & Helsby Cables	5	10	10	7$\frac{7}{8}$ — 8$\frac{1}{4}$	..	6 1 3
Do. Pref.	5	6	6	5$\frac{7}{8}$ — 6$\frac{3}{8}$	..	4 14 1
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	96 — 98	..	4 11 10
British Westinghouse, Pref.	3	Nil	..	$\frac{7}{16}$ — 1$\frac{1}{16}$	..	Nil
Do. Deb.	100	4	4	58 — 61	..	6 11 2
Do. 6 % Prior Lien	100	6	6	102 —105	..	5 14 3
Browett, Lindley, Ord.	1	Nil	..	2/- —3/-	..	Nil
Do. Pref.	1	Nil	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	..	0 — ½	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	75 — 80	..	6 5 0
Do. 4½ % Deb.	100	4½	4½	52 — 57	..	7 17 10
Do. 4½ % Second Deb.	100	4½	4½	35 — 40	..	11 5 0
Callender's Cable	5	15	10†	10½ — 11	..	6 16 4
Do. Pref.	5	5	5	4⅞ — 5⅛	+ $\frac{1}{16}$	4 17 7
Do. Deb.	100	4½	4½	99 —101	..	4 9 1
Castner-Kellner	1	17½	20	8⅝ — 8¾	..	5 6 8
Do. Deb.	100	4½	4½	102 —105	..	4 5 9
Crompton & Co.	8	Nil	Nil	$\frac{1}{8}$ — $\frac{3}{8}$	..	Nil
Do. Deb.	100	6	5	66 — 66	..	7 11 6
Dick, Kerr	1	5	5	$\frac{3}{4}$ — $\frac{7}{8}$	..	6 14 3
Do. Pref.	1	6	6	1 — 1$\frac{1}{8}$	..	5 6 8
Do. Deb.	100	4½	4½	95 — 98	..	4 10 10
Edison & Swan, A, £8 paid	5	Nil	..	$\frac{9}{16}$ — $\frac{13}{16}$	..	Nil
Do. fully paid	5	Nil	..	1$\frac{7}{16}$ — 2$\frac{1}{8}$	..	Nil
Do. 4 % Deb.	100	4	4	64 — 68	..	5 17 8
Do. 5 % Second Deb.	100	5	5	75 — 78	..	6 8 2
Electric Construction	2	2½	3⅜	$\frac{3}{4}$ — 1	..	7 10 0
Do. Pref.	2	7	7	1⅞ — 2	+ $\frac{1}{16}$	7 0 0
Greenwood & Batley, Pref.	10	7	7	7½ — 8	..	8 5 8
Do. Deb.	100	5	5	92 — 94	..	5 4 2
General Electric, Pref.	10	5	5	10 — 11	..	4 10 1
Do. Deb.	100	4	4	92 — 97	..	4 2 6
Henley's, Ord.	5	15	10†	12 — 12⅝	..	5 16 8
Do. Pref.	5	4½	4½	4⅞ — 5⅛	..	4 7 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
India-Rubber, G. & T.	10	10	..	9½ — 10½	+ ½	..
Do. Pref.	10	5	5	9½ — 10½	..	4 17 7
Telegraph Construction	12	20	10†	32½ — 34½	..	6 16 6
Do. Deb.	100	4	4	97 — 99	..	4 0 10
Willans & Robinson	1	Nil	..	$\frac{1}{8}$ — $\frac{1}{4}$	..	Nil
Do. Pref.	5	Nil	..	$\frac{3}{4}$ — 1	..	Nil
Do. Deb.	100	4	4	58 — 60	..	6 13 4

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 3 per cent., May 9th, 1912.

REVIEWS.

Steam Turbines. A Short Treatise on Theory, Design and Field of Operation. By Joseph Wickham Roe, M.E. London: Hill Publishing Co. Price 8s. 6d. net.

This book, of convenient size, is intended, as stated by the author in his preface, to serve as a text-book for students, and as a treatise on the principles and general design of turbines for the engineer. The scientific principles involved in turbine problems are gone into in turn with brevity and in a clear sequence, and the formulæ deducted from the facts are quoted and explained.

The mechanical problems which form so very important a part of turbine design have, perhaps, too little space assigned to them. The work has the effect of a summary of present knowledge on the subject, and it hardly falls within its scope to allude to the mishaps from which turbine builders have learned so much. The illustrations are numerous and excellent.

The Evolution of the Parsons Steam Turbine. By Alex. Richardson, A.I.N.A. London: Offices of *Engineering*. Price 21s.

The progress of civilisation to any end is the resultant of several forces—mentally the invention of printing placed the whole world on an entirely new plane and industrially the steam engine and the railway have produced results profoundly modifying sociological development. Indeed, as the author points out in his opening paragraph, "the history of invention is the key to an understanding of many of the movements of the world." A history of the evolution of an epoch-making invention, written from the perspective of the day in which the development occurred, and thus lacking the wider perspective open to the historian writing in a later age, serves a double purpose in giving precise information to the present generation, and in affording a competent authority for the historian of the future to consult.

The author's work is well done. It shows, too, the large number of subsidiary problems which arise as the immediate consequence of any one invention. The turbine has presented many such to the shipbuilder, to the maker of propellers, to the designer of alternators or direct-current dynamos, and to the metallurgist also in regard to the requisite properties of turbine blades.

Through the joint effect of the turbine and the big gun, standards of naval strengths and international policies have been largely modified.

Very many of the author's pages are devoted to the marine aspects and problems of the steam turbine, and very succinct summaries are given of the position attained up to the time of publication.

Only a small section of the book is given to the electrical side of turbine development. Yet this chapter might well be reprinted separately for the use of third-year students in engineering schools and colleges. Really, no better insight can be given to successful design than that based on a sound knowledge of the forces determining its evolution. This section is only weak in that, in the reviewer's opinion, insufficient stress is laid upon the problems of stator coil and rotor insulation for turbine-driven A.C. generators.

Another interesting section deals with the exhaust steam turbine and the turbine type of air compressor.

A Handbook of Testing Materials. By C. A. M. Smith. London: Constable & Co., Ltd. Price 6s. net.

The possibility of the attainment of a high degree of human knowledge is severely limited. The average engineer is not a genius, and no matter how keen he may be on the acquisition of knowledge, he is compelled to classify information as either immediate and practical in its value, or as remote and academic in character. Each man has to form a very elastic boundary between that which he must assimilate as concerned with daily bread and butter, and that which appeals by reason of its general technical interest. But to the engineer there can be no question as to the paramount importance of the properties of materials and methods of checking those properties.

Designed primarily as a text-book for the student in the well-equipped mechanical laboratory of a modern college, it treats of testing machines in general for iron, steel, cement, &c. In addition, it gives in all cases valuable notes as to the normal properties of materials. It may be commended to all engineers, including those no longer actually designated as students. Many such may not have had the educational facilities that are extended to the present generation. Mr. Smith's book offers to them a concise account of recent developments in testing machines with explanatory matter which renders the results obtained both intelligible and comparable.

One suggestion the reviewer would like to present to the author, and that is that the second and subsequent editions should discuss the manifestations and causes of abnormalities generally met with in the materials of mechanical engineering.

Diesel Engines for Land and Marine Work. By A. P. Chalkley, B.Sc., A.M.Inst.C.E., A.I.E.E. With an introductory chapter by Dr. Rudolf Diesel. London: Constable & Co., Ltd. Price 8s. 6d. net.

At such a time as the present, when the attention of every engineer, and indeed of every thinking individual, is directed to the consideration of natural sources of energy, the appearance of this book is particularly opportune. The recent coal strike has taught everyone that it is in the general interest to seek means for economising in the use of the stock of fuel available. The report of the Committee of the British Science Guild, upon which we commented in our issue of April 5th of this year, has given a further impetus to thought and work along the same lines. If the stock of coal on the surface of the earth can be made to go twice as far as formerly, then obviously the terrors of a coal strike are reduced by half.

Mr. Chalkley remarks, at the beginning of his last chapter, that "the possibilities which open out in the future for engines of the Diesel or similar type, are so wide that it is necessary to restrain a natural tendency to fall into immoderate language when touching upon this point." We agree; for it is certain that there is no means which would more effectually retard the growth of the use of such engines. Fortunately we can acquit Mr. Chalkley of this fault, for throughout his book he writes with studious moderation.

Starting with a chapter in which he considers the general theory of heat engines, he goes briefly but sufficiently into the consideration of the expansion of gases, adiabatic expansion, isothermal expansion, and the working cycles of heat engines, leading up to reasons for the high efficiency of the Diesel engine. The remaining seven chapters are devoted solely to the discussion of the Diesel engine—its action and working, construction, installation and running, its testing, and its use for marine work.

There are those who say that as England is a coal-producing country, having up to now no natural oil supply, and that as the use of oil fuel would render her dependent upon other countries, the Diesel engine is something which Englishmen would do well not to encourage. In the very thoughtful introduction which he has contributed, Dr. Rudolf Diesel deals effectively with this and other objections. Coal itself, tar oils, or crude tar, can all be used directly in the Diesel engine, and there is no need whatever to use petroleum. The Diesel engine will work equally well with vegetable oil, or animal, or fish oil, and the French Government has considered the question of utilising the large quantities of arachide, or ground nuts, available in the African Colonies, thus gaining not only a cheap source of power, and that independently of foreign countries, but also providing industry for the Colonies themselves. Now, England has more Colonies than any other nation, and, as a consequence, this question concerns her more than it concerns other nations. Further, the greater room available for the carrying of cargo in Diesel ships, due to the fact that less fuel is required, and that that fuel can be stored in positions which, owing to their inaccessibility, are useless for any other purpose, is most emphatically a question which concerns, very nearly indeed, the greatest shipping power in the world. True, the

experience available with the use of the Diesel engine afloat is not yet so great as that which has been gained with its use on land, but it is growing very rapidly, and there is no reason whatever to expect that any undue difficulties will be encountered in so using Diesel engines. Further, the Diesel marine engine does not differ greatly from the land type, and so experience gained with the latter is, in Mr. Chalkley's words, "in a measure equivalent to that which would have had to be obtained at sea were the construction different in any marked degree."

The use of the Diesel engine in electricity works has made great strides during recent years, and we do not see any reason why progress should not be maintained, and, in fact, augmented. Central station engineers have, more than once lately, discussed the question, and the chief point which seems to be brought out is this: that these engines are considered to be most suitable and most economical in undertakings which run at a poor load factor. For a large industrial town, having a plant load factor of, perhaps, 40 or 45 per cent., it has been said that internal combustion engines are not so satisfactory. Mr. Chalkley tells us that the overload capacity is from 10 to 15 per cent. for two or three hours. When one considers the constant 60 per cent. overloads which many steam turbine sets are called upon to stand, this seems small. But what does it really mean? Simply this—that the internal combustion engine does the work which it is designed to do, and is correctly rated; while the steam turbine is designed to do a great deal more than its nominal rating. Therefore, if you want to get 7,500 KW. out of a Diesel engine, you must install a 7,500-KW. engine. If you want an occasional 7,500 KW. out of a turbo-alternator, it need only be a 4,000-KW. machine. This is a fact within our experience, and we are not exaggerating at all. The whole thing is a question of definition. If, when you say one kilowatt you mean one kilowatt, you are all right with your Diesel, but if you mean something quite different, you must learn to say what you mean.

Turning to the literary side of the book, we are glad to say that we have few faults to find. The pleonastic use of the word "one," as in the sentence "the constant-pressure cycle is a rather less efficient one than the constant volume one," on page 25, and another on page 106, which is even worse, is, perhaps, the most persistent. There are two or three split infinitives, but we are tired of pointing out this fault in scientific books. There is no need to put a full stop after the word "grams" every time it occurs, for it is not an abbreviation, except in the sense that all Americanisms are abbreviations. On page 19, fig. 5, the letters v_2 and v_4 should be interchanged, and on page 187 the angle BOA should be lettered *d*, but is not. On page 211, line 11, the figure 1 should be replaced by an italic *l*.

Concise, distinct, up-to-date, well illustrated and well indexed, the book should find a place in the library of every engineer who wishes to keep abreast of modern developments.

Elementary Internal Combustion Engines. By J. W. KERSHAW. London: Longmans, Green & Co. Price 2s. 6d. net.

This is a most excellent production. It is really one of the best text-books that we have come across for a long time. The buyer obtains excellent value. The matter is good. There are 117 illustrations (nearly all of them well executed) and there are 171 pages. As a companion to the excellent little treatise on "Steam," by Prof. Ripper, we can think of no better book for the young student of motive power engineering.

The author informs us that this book is intended to give an elementary account of the construction and working of internal combustion engines and power gas producers, and to serve as an introduction to the more advanced books dealing with the subject, and he certainly accomplishes his intention. He has made his explanations fairly simple, has taken care with his illustrations, and has not attempted to cover too much ground. There are some very good numerical examples in the text, but we think it a pity that there are no examples for the student to work out on his own initiative. There is quite a good description of the Diesel engine, and a good deal about the Humphrey pump. About two pages are given to the gas turbine, which is, after all, quite enough for an elementary book. The last chapter on engine efficiency is quite up to the standard found elsewhere.

It is not often that we are able to say that a new text-book supplies a long-felt demand. We are delighted to be able to record the fact that this book has been needed for the last five or six years. It is, of course, elementary; no originality was needed, nor is it displayed. There is no evidence that the author is a prominent expert on the subject. It is probable that he is not, otherwise he would not have done his work so well. He has, however, written in a clear and careful manner a little book upon a subject which has previously caused the student difficulty, because of the lack of such a little treatise. He is, therefore, to be congratulated. After all, it is better to supply such a demand than to write ten times the amount upon a more complicated subject in such a fashion that no one understands it. A student of very average intelligence could follow the contents of this book and gain advantage from a complete study of its contents.

RULES FOR ELECTRIC OPERATING STAFFS.

[COMMUNICATED.]

(*Concluded from page 274.*)

THE other department in which a set of regulations is necessary is in the keying together of operations of the various sections of the operating staff. In the electricity supply undertaking this is chiefly evident in the work of the generating-station staff as connected with the mains department. Especially on high-pressure systems this co-ordination must not be left in a haphazard condition, and numerous stations have adopted a set of rules for this purpose. By the courtesy of the Chief Engineer of the Bedford Corporation Electricity Works, the writer is able to give a complete set of regulations formulated for this purpose, and this article will conclude by detailing these as an instance of the type of regulation which will be found of value in electricity supply undertakings. It will be seen on examination that some features of the regulations are strictly local, but their chief value in connection with the present notes is that they might very well form a basis for the construction of a standard set of operating regulations which might apply in the main to all electricity undertakings of this type. If such regulations could be drawn up and accepted as standard, there would probably be less confusion in such undertakings, due to the change of *personnel*. That this is an important point will, on reflection, be acknowledged by most central-station chiefs, inasmuch as the change of operating staffs usually involves the chief engineer in a period of some anxiety until he is perfectly sure that the new man has fitted into his job without the possibility of a mistake in judgment or operation.

The regulations referred to are printed on large cards with varnished surfaces, which are hung in a prominent position in the engine room, and are therefore capable of easy inspection at all times. The small forms, referred to as A, B and C, are printed cards of postcard size, their general appearance being shown below. The regulations read as follows:—

BEDFORD CORPORATION ELECTRICITY SUPPLY.

Instructions for carrying out work on:
HIGH-TENSION SWITCHBOARD AT THE GENERATING STATION.

General.

1. *Under no circumstances is any work to be executed on any high-tension cable, transformer or other apparatus, unless the proper steps have been taken to make the same "dead."*

2. **In every case, before any H.T. apparatus is touched, two persons in authority are to assure themselves independently that the apparatus is "dead," and must connect the same to earth.**

3. **When withdrawing or replacing any H.T. fuse or isolating switch, rubber gloves are to be worn on both hands, and a rubber mat or insulating stool is to be used to stand on. All rubber gloves must be examined for punctures each time before using by rolling**

up from the wrist, and no glove is to be used or retained for use showing signs of wear, or liable to cause undue risk.

4. The doors protecting the main bus-bar cells are on no account to be removed.

5. *Generator Panels.*—Panels G 6, G 7, G 8, G 9 and G 10.

(*a*) Before removing the small inspection slate on the front of each panel—

(1) The generator must be stopped;
(2) The exciting circuit opened; and
(3) The switch blocked open or the isolating plugs withdrawn.

(*b*) Before removing the back door of the cell—

(1) The generator must be stopped;
(2) The exciter circuit opened; and
(3) The isolating plugs withdrawn.

N.B.—It follows from the above that should a potential transformer fuse blow, or the low-tension wiring become deranged in any way, no steps can be taken to repair until the generator is taken out and shut down.

6. *Main Panel.*—The back cell door to be removed only for the purpose of replacing a potential transformer fuse. Before doing this, there must be two persons present, each wearing a pair of rubber gauntlets and a pair of insulating shoes.

7. *Feeder Panels.*—When work is to be done on the feeder panels, all must be treated as being interconnected at the sub-stations, and must therefore be considered as being "alive" until disconnected outside. Before working on any apparatus in connection with a feeder panel, it will therefore be necessary to—

Send written requisition (Form A) to the mains foreman to clear feeder, stating name of feeder (as printed on the panel tablets), and only when such requisition has been returned signed by the mains foreman or other authorised person, stating that the feeder is clear from outside, may the work proceed as follows:—

8. *Queen's Engineering Works Panel.*—

(*a*) Before removing inspection slate—

(1) Open switch, lock off, and before commencing work behind the inspection slate.
(2) Earth H.T. terminals at both poles.

(*b*) Before removing back cell door—

(1) Open switch and lock off.
(2) Withdraw isolating plugs.
(3) Remove inspection slate.
(4) Earth H.T. terminals.

9. *Queen's Engineering Works Fuseboards.*—Work on these fuseboards should as far as possible be done only when the same are "dead." If, however, it becomes necessary to renew a fuse without interrupting the supply, this must only be done by means of the special grips provided for the purpose, and there must be two persons present equipped as in 6. To make fuseboards "dead," proceed as in 8 (*a*).

10. *Sewage Pumping.*—(1) Feeder must be cleared as set out in 7; then (2) proceed as in 8.

11. *Feeder Group Switch Panels.*—

(*a*) Before removing inspection slate—

(1) Open and lock off switch.
(2) Take out all H.T. fuses on the group.
(3) Observe if group voltmeter is reading zero. Then remove inspection slate, and
(4) Earth H.T. terminals.

N.B.—This can, of course, only be done on light load, or in cases of extreme emergency, and notice must be given to the mains foreman in order that the section pillar fuses can be strengthened if necessary.

(*b*) Before removing back cell door—

(1) Proceed as above, and
(2) Withdraw isolating plugs.

12. *Fused Feeder Panels.*—

(*a*) Before removing any of the small doors protecting each individual fused feeder connection—

(1) Feeder must be cleared as set out in 7.
(2) Remove fuses on both poles.
(3) Lock off.
(4) Earth top terminal of fuse on each pole.

(*b*) Before removing door protecting sub-bus-bar, proceed as in 11 (*a*).

13. *Potential Transformer for Tirrill Regulator.*—Before renewing fuses or doing any work on transformer—

(1) Open and lock off Group C switch.

14. *Electrostatic Earth Detector.*—No work is to be done on this unless the main bus-bars are "dead."

15. *London Road Feeders.*—

(*a*) Before removing the inspection slate—

(1) Both feeders in the panel must be cleared as set out in 7.
(2) Open and lock off switches.
(3) Remove inspection slate and earth the H.T. terminals.

(*b*) Before removing back cell door—

(1) Clear both feeders as above.
(2) Open switches and lock off.
(3) Withdraw isolating plugs.
(4) Remove inspection slate and earth H.T. terminals.

N.B.—If work is to be done on the H.T. feeder or apparatus at sub-station at the same time, in addition to the above, it will be necessary to observe Regulations 17, 18, 20, 21.

For re-connections observe Regulations 18 (2), (3), (4) and (5).

BEDFORD CORPORATION ELECTRICITY SUPPLY.

Instructions for carrying out work on: High-tension Feeders.

16. *Clearing H.T. Feeders for Work on H.T. Switchboard.*—On receipt of a requisition (Form A) from the generating station to clear a feeder—

(1) Obtain card of particulars for the feeder named on the requisition note to the effect that all instructions have been carried out, and return to engineer in charge at generating station.

N.B.—The feeder, however, is not "dead," and no work is to be done on any feeder or apparatus in connection therewith until precaution 17 has been completed.

For re-connections see Regulations 18 (2), (3), (4) and (5).

17. *Before working on any H.T. Feeder.*—

(1) Obtain card of particulars for the feeder and proceed to disconnect as therein stated.

(2) Send written requisition (Form B), naming the feeder, to the engineer in charge at the generating station to lock off and earth both terminals of the feeder at the works.

(3) Receive key of locking-off gear from the engineer in charge, together with signed statement (Form C) to the effect that the feeder is "dead."

(4) Note carefully on the card of particulars the instructions for locating the feeder in the street draw-in and joint boxes.

(5) When the first cut in every draw-in or joint box is made, two persons must be present, each wearing rubber gloves and insulating shoes, or standing on rubber mats, and the blade of the saw, after it has reached one conductor, must be put to earth, and should there be any evidence of the cable being "alive," all work is to be stopped, and not proceeded with until the matter has been reported to the chief engineer or the deputy-engineer, and his sanction obtained for proceeding.

N.B.—It must be distinctly understood that no work is to commence or proceed on a H.T. feeder unless the employé actually doing the work holds on his person the key of the locking-off gear and the written statement of the engineer in charge referred to, and if others are working on the feeder at the same time, they must also hold signed statements to the effect that the feeder is "dead."

18. *Instructions for Reconnecting H.T. Feeders.*—

(1) When the employé working on the feeder has made all good and safe, he must return the key of the locking-off gear to the charge engineer, together with the statement (Form C) signed by him to the effect that the feeder can safely be connected to the H.T. supply, and if others have been working on the feeder at the same time, each must sign and return Form C.

(2) The charge engineer must then unlock feeder terminals and remove the earth connections, and test the feeder with an ohmmeter, recording the results of such tests on the disconnection form.

(3) If the test be unsatisfactory in any way, the charge engineer shall replace the earth connections, lock off feeder, and report immediately to the chief engineer or deputy, and receive sanction for proceeding.

(4) If the test be satisfactory, or sanction (as above) be received, the charge engineer, after examining and renewing (if necessary) the fuses, shall replace them, thereby making the feeder "alive."

(5) The charge engineer shall then give the mains foreman a written statement (Form A or B) to the effect that the feeder has been made "alive" at the generating station, and the mains foreman shall have the feeder reconnected at the sub-station, &c., as directed on the card of particulars.

Instructions for carrying out work on: High-tension Apparatus in Sub-stations.

19. Two persons must always be present when a sub-station is entered, or when the "Kiosk" transformer pillar is opened.

20. Except the renewing and replacing of fuse handles, no work is to be done on a H.T. fuseboard unless the same has been made "dead."

Before working on H.T. Fuseboards.—

(1) Carry out instructions set out in 17 as for H.T. feeders.
(2) Remove L.T. fuses of all transformers.

21. No high-tension fuse is to be replaced until signed statement (Form A or B) has been issued and received.

22. *Before working on a Transformer.*—

(1) Withdraw high-tension fuses on both poles.
(2) Withdraw L.T. fuses on transformer.

23. *When reconnecting a Transformer.*—

(1) Replace middle-wire fuse.
(2) Test with 10-amp. fuses on L.T. outers.
(3) Remove 10-amp. fuses and replace H.T. fuses.
(4) Test for correct banking.
(5) If correct, replace L.T. outer fuses.

The regulation forms referred to above are of the nature shown herewith :—

BEDFORD ELECTRICITY SUPPLY. A

H.T. FEEDER DISCONNECTION.

NAME OF FEEDER.

Date..... Time.....

TO MAINS FOREMAN.

Please disconnect the above Feeder from the H.T. external system at all points for work on MAIN SWITCHBOARD, and report by.....

.....19.....

Signed.....CHARGE ENGINEER.

N.B.—The Mains Foreman will note that as soon as the above work is completed the above Feeder will be made ALIVE at the Generating Station, and that he must not permit anyone to work on the Feeder or any cable or apparatus connected thereto.

Date..... Time .....

TO THE CHARGE ENGINEER.

The above Feeder is disconnected from the H.T. external system at all points

Signed .....MAINS FOREMAN.

Date ..... Time .....

TO THE MAINS FOREMAN,

The above work is completed, and the Feeder made ALIVE. Please re-connect at all points.

RESULT OF TEST.

Signed.....CHARGE ENGINEER.

Date..... Time.....

TO THE CHARGE ENGINEER.

The above Feeder has been re-connected at all points.

Signed.....MAINS FOREMAN.

BEDFORD ELECTRICITY SUPPLY. B

H T. FEEDER DISCONNECTION.

NAME OF FEEDER.

Date..... Time.....

TO THE CHARGE ENGINEER.

Please withdraw H.T. Fuses, EARTH and lock off the above Feeder which is disconnected from the H.T. external system at all other points.

The following Jointers will work on this Feeder :—

NAME OF JOINTER.	LOCALITY.

Signed..... .....MAINS FOREMAN.

Date..... Time.....

TO THE MAINS FOREMAN,

The work being reported complete, the above Feeder has been made ALIVE at the Generating Station. Please re-connect at all points.

RESULT OF TEST.

Signed.....CHARGE ENGINEER.

Date..... Time.....

TO THE CHARGE ENGINEER.

The above Feeder has been re-connected at all points.

Signed.....MAINS FOREMAN.

BEDFORD ELECTRICITY SUPPLY. C

H.T. FEEDER DISCONNECTION.

NAME OF FEEDER.

Date..... Time.....

TO JOINTER.

The above Feeder is locked off and both poles EARTHED; it will remain locked off until you sign below and return this card to the Generating Station, when the Feeder will be made ALIVE.

Signed.....CHARGE ENGINEER.

Date..... Time.....

TO THE CHARGE ENGINEER.

Work on the above Feeder is completed, and Feeder left safe to be made alive at the following points :—

Signed.....JOINTER.

N.B.—The Charge Engineer must issue one of these forms to each Jointer working on Feeder, as set out on Form B by the MAINS FOREMAN.

The above regulations are, of course, only given here as illustrative types, but there is sufficient in them of standard nature to render them of interest to every electricity supply undertaking, and the present notes are written with the object of initiating a discussion in this journal on the question of formulating a standard set of operating regulations which, so far as possible with local modifications, can be adopted in medium-sized electricity supply undertakings for the purpose of codifying the operating systems of such plants into a closely uniform nature, for the purpose of training operating engineers, so far as routine operations are concerned, on as standard a basis as possible.

PRIVATE BILLS OF THE PAST SESSION.

[BY OUR PARLIAMENTARY REPORTER.]

COMPARATIVELY little space is needed to sum up the results of the past session, so far as electrical clauses in private Bills are concerned. To start with, such Bills were few in number, and whilst, of course, a great deal of local interest attached to some of them, few were of national interest. Bills dealing with tramways and electric lighting are now framed in almost identical language, for past experience has led to the adoption of model clauses, with the result that, apart from the vital question of whether or not the powers asked for should be allowed, there is little discussion over the actual wording of clauses. If the projects for railless traction schemes are excluded—and these cannot really be termed new—there were no proposals of a novel character. In only one direction can it be said that there seems a bright future for big extensions of electrical enterprise requiring the sanction of Parliament, and this is in respect to the electrification of railways for the proved success of the system in London is gradually leading to its adoption on lines which go considerably beyond the Metropolitan area.

From this point of view, the most interesting Bill was that of the Midland Railway Co. for the taking over of the London, Tilbury and Southend Railway. Although the Bill itself contained no powers to electrify the line to Southend, the promoters declared that it was their intention to carry out such a scheme, and in the end the Bill was passed subject to an undertaking that the Midland Co. would

come to Parliament for the necessary powers to do the work within a reasonable time. Two Bills closely associated with one another so far as the work intended to be carried out is concerned, were the London Electric Railway Bill and the London and North-Western Railway Bill. The main object of the London Electric Railway Co.'s Bill was to allow them to construct a line from Paddington to Queen's Park, and at that place to form a junction with the London and North-Western Co.'s line to Watford, now being electrified. The latter company are prepared to advance the necessary capital for the construction of the line, and they took powers in their Bill to enter into agreements, &c. The London Electric Railway Co. also obtained powers to amalgamate the Hampstead and Edgware Railway Co., who have authority to construct a line between those places, as an extension of the Charing Cross, Euston and Hampstead Railway. The Metropolitan Railway Co. failed in their attempt to obtain powers to construct a new railway at Hammersmith to join up with the authorised new line of the Great Western Railway Co. to West Ealing, and thus to have given a further route between London and Ealing, but they succeeded in getting authority to extend their line from Watford to Rickmansworth, which will add another desirable residential district to the London workers. The Metropolitan District Railway Co. got very important powers by which the London and South-Western Co. will widen their Wimbledon and Fulham Railway, and give the Metropolitan Co. the exclusive right of use. This will very materially assist the District Co. in the management of their traffic. The Great Eastern Railway Co. sought powers to raise £90,000 debenture stock, which will be devoted to the electrification of the unfortunate East London Railway Co., which has struggled with adversity for so many years, and it is to be hoped that the change will prove as successful as it has with the Metropolitan and the District Lines.

Several Tramway Bills affecting the London area were promoted at the beginning of the session, but those of the West Ham Corporation and the Metropolitan Electric Tramways Co. were withdrawn, the latter company having come to a satisfactory arrangement with the London County Council. As usual, the London County Council came forward with a big programme of new tramways, and as usual also the opposition of local road authorities prevented most of them getting through Standing Orders stage. After a great deal of opposition the Council obtained powers to extend the tramway in Tooley Street, but coupled with conditions as to the times of the day during which the extension should be used. By far the most important power obtained by the Council was, however, to run coupled cars or trailers. At present the authority to do this is limited practically to the South side of the river and the Thames Embankment, with a view to seeing how the thing works in actual practice. The London United Tramways Co. secured an extension of time for the completion of the authorised tramway at Richmond.

Of the proceedings relating to provincial schemes the most interesting was the fight for Brighton and Hove and District. Here there were no fewer than four Richmonds in the field, and in the end matters became somewhat complicated. They were (1) the Brighton and Hove Omnibus Co.; (2) the Brighton Corporation; (3) the Hove Corporation; and (4) the British Electric Traction Co. The first-named retired from the fight at an early stage, having come to a satisfactory settlement with the Brighton Corporation. As the result of the hearing before a House of Lords' Committee, the British Electric Traction Co.'s Bill was rejected, whilst both the other Bills for the construction of railless traction systems within their respective boundaries were passed, with the hope being expressed that the parties would come to a mutual understanding regarding the working of the tramways. When the parties came before the House of Commons' Committee, the British Electric Traction Co. appeared as opponents, and were successful in getting some compensation from the Hove Corporation for the removal of the present old horse tramway. It became evident also that Hove really did not want railless or any other kind of tramway within their boundary, and that they had really come forward in self-protection, fearing that an outside Corporation or company might get into the district. In the end, however, both the Bills were passed as was the case in the Lords. A strenuous fight took place over the proposals of the Birmingham Corporation to extend their tramways into the Edgbaston and Harborne district, but in the end the Corporation only got a part of the powers for which they asked. Keighley Corporation were empowered to use trolley vehicles, and Hull Corporation to further extend their tramway system. Other local authorities successful in obtaining railless trolley powers were the Ramsbottom U.D.C., Sheffield Corporation, and Stockport Corporation. One new company, *i.e.*, the North Ormesby, South Bank, Normanby and Grangetown Railless Traction Co. was successful in getting its Bill through, but the Southall, Hounslow and Twickenham Bill met an early death.

There were no English Electric Power Bills. The Sidmouth U.D.C. got powers to take over the undertaking of the Sidmouth Gas and Electricity Co. The National Electric Construction Co. got through their Bill to confirm agreements made between the company and their predecessors and certain local authorities with regard to the supply of fittings. On the Sheffield Corporation's Bill there was an interesting fight with regard to the power of the Corporation to supply electric fittings, which resulted in the Corporation being restricted to the model clause by which they are not at liberty to execute the wiring of private property except between the main of the Corporation and the consumer's meter, nor can they sell electric fittings except through a contractor.

The Bognor Gas Light and Coke Co. obtained electric lighting powers on coming to an arrangement with a local owner who already generates his own electricity for a large block of buildings and was applying for an electric lighting order for himself. The following Scotch provisional orders were proceeded with as private Bills, and carried: Lanark Tramways and Loch Ericht Water and Electric Power.

"TO THE TRADE."

By "JUGGINS."

The system of discounts now in use in the electrical trade is, in its present chaotic form, often a source of great annoyance and trouble to those who have any dealings with it.

To many of our smaller "business" men the intricate calculations involved in arriving at cost prices and suitable selling prices are much beyond their mental capacities, and do more towards turning their hair grey than the more practical part of their work. An "electrician" is not necessarily a highly intelligent specimen of manhood, and more often than not the man who makes the best of a wiring job is the one who flounders most in the maze of figures he has to go through before he can estimate for a single contract. More than that, should the electrician have to supply goods from several different manufacturers, he has to carry in his mind numerous figures representing the various discounts offered, which are easily forgotten or mixed. Further, many of the figures are so cumbersome that it is impossible to work with them at all unless the scribbling pad is handy. It is, to say the least, very humiliating to have to use a pencil and paper every time one has to quote a price.

No one who gives thought to this question will fail to appreciate any suggestion that gives prospects of reform; but, at the same time, we all realise the difficulties to be encountered in bringing about that reform. The variations in market prices is the first and greatest obstacle in the way of progress, yet with a little care and forethought the writer is sure that even that obstacle could be surmounted.

There is another aspect to the case which it behoves us to consider, namely, the fleecing of the customer. Electricians are inclined to favour the firms giving the greatest discounts, in order that by charging full list prices to their customers, they may realise profits which, to put it very mildly, are grossly unfair. One will readily allow that a man who invests his capital, be it £5 or £5,000, in a business of any sort, has a right to make a reasonable profit, but in the electrical trade, as in other trades, profits

often attain to the unreasonable. For this the manufacturers are largely responsible, for by offering a trade discount of, say, 50 per cent., they are inducing the contractors not only to buy their goods, but also to sell them for more than their worth, since, if the discount is high, the list price is then in reality much more than the real value of the article. The contractor does not buy cheaper where a big discount is offered, but charges more for the goods.

The writer now proposes to give some figures which will well illustrate the weaknesses of the present system of discounts by showing the absurdity of some discounts, the effects of varying market prices on them, and the unreasonableness of the profits made allowable by reason of badly fixed discounts.

We will take first the case of a firm who list all their goods in a single catalogue, but who give a different percentage to the trade according as the goods purchased are listed at the beginning, the middle, or the end of the catalogue. Now, this is absurd enough, but it is not quite as bad as the case where a discount of $47\frac{1}{2}$ per cent. was quoted. To work with such an unwieldy figure as $47\frac{1}{2}$ per cent. is out of all reason. The writer has tried to analyse the figure to see if there is any logical reason for adopting it, and to find some simple method of working with it, but, so far, has failed.

Another instance is rather a good one. A certain firm recently quoted a trade discount of $33\frac{1}{3}$ per cent., with a preferential discount in a special case of a further 15 per cent., and, in addition, the usual 5 per cent. for cash. Is it possible to imagine anything more beautiful? The writer has calculated that the ultimate discount in this case is $46\frac{1}{6}$ per cent.—truly a wonderful figure.

Now, why cannot we, once and for all, drop such absurdities and adopt reasonable and decent figures? Why should we dabble with $46\frac{1}{6}$ per cent. or $47\frac{1}{2}$, when 50, practically the same figure, would do just as well? More than this, why cannot we have the same discount on all lines and from all firms?

Difficulties will at once arise when the market begins to vary, but the following example of the effect under present conditions will show that things cannot be worse than they are now.

The trade were recently notified that, "owing to the increased price of raw material, prices would be increased 10 per cent.," and a few weeks afterwards a further 10 per cent. rise was announced. Now let us apply this to the case we last cited, and see the effect.

Let us assume, for convenience, a certain article is listed at £100; after the first increase, this price has risen to £110, and eventually to £121, although some firms preferred to treat the ultimate increase as one of 20 per cent. instead of 21 per cent. Now, working, perhaps, in a roundabout fashion in order that the illustration may be all the more effective, on taking $46\frac{1}{6}$ per cent. from £121 we are left with a cost price of (to be precise) £65 83/600, which leaves a discount off the original list price of 34 517/600 per cent. Truly wonderful!

Now the writer proposes to meet variations of this nature by a decrease in the discount instead of an increase in the list price. He claims that the contractor or small business man is chiefly concerned with the price he has to pay for his goods, and not the price they are listed at. He fixes his charges for them accordingly. Let us arrange then that instead of making an increase of 10 per cent. in the catalogue price we simply decrease the discount 5 per cent., that is, give the contractor only 20 per cent. in place of the 25 per cent. he was originally allowed. The tradesman would thus know readily what his goods cost and could fix his selling price accordingly. Further, variations could be arranged to affect all goods at the same time by giving a slightly less discount on all things instead of making substantial increases on some lines only. Although a suggestion of this sort would certainly come in for some scathing criticism from various sources, yet it has merit in that it tends to simplify greatly our business system. The problem of fixing a fair alteration in the discount either way would indeed be a difficult one, but we must remember that every manufacturing firm has many clerks who thrive on works costs and the like, and who would think nothing of problems of this nature. More than that, the working of one problem would finish the whole matter, whereas now each contractor has to do his own calculations, which many of them find much too difficult.

Finally, in dealing with the unreasonableness of the profits made allowable by some discounts, we must bear in mind that nine out of every ten of our customers ask for a discount off the list price, in which case it may be an advantage to be allowed 50 per cent.; but, generally speaking, 50 per cent. is too high a discount. In a case where 50 per cent. and an additional 10 per cent., and the usual 5 per cent. cash allowance were made, a certain article was sold at the full list price. On calculating out the profit, the tradesman was surprised to find that he had realised 134 per cent., which is, beyond question, unreasonable.

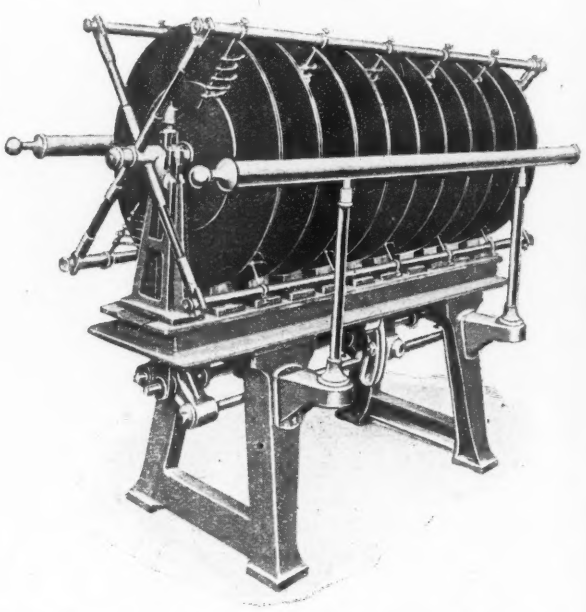
Why cannot we, then, try to adopt some system which will be fairer to manufacturer, contractor and consumer alike. The evil that is done by such large discounts can be remedied, the complications of figures can be smoothed out, and the worry that is caused to the contractor can be done away with.

If every firm were to adopt a trade discount of, say, 30 per cent., and to counterbalance increases in the production costs by small decreases in the discounts much of the present trouble could be avoided. The variations in the trade terms need not involve more unwieldy figures than 5 per cent.; and in hoping that some improvement will be forthcoming, the writer is confident that the adoption of the above suggestions would be a real boon and blessing.

A POWERFUL ELECTROSTATIC MACHINE.

Whereas high-tension alternate currents are generated with relative ease by means of transformers, the only available source in the case of direct currents are electrostatic machines.

In view of the inadequacy of these machines, as so far constructed, H. Abraham and P. Villard, in connection with their work on high direct-current potentials, recently entrusted M. Roycourt, at Paris, with the construction of an extremely powerful electric machine destined for their laboratory at the Ecole Normale Supérieure.



Electrostatic Machine for the Ecole Normale Supérieure

This machine is of the Wimshurst-Bonetti type, with opposite rotations and without sectors, the extremely high potential being due to the use of disks 73 centimetres in diameter. The current output depends on the surface area passing in a given time in front of the combs, and

accordingly, on the number of disks and their speed of rotation. Roycourt, therefore, adopted 20 disks with a maximum speed of 1,500 R.P.M. This condition, while subjecting the insulating substance (ebonite) to a tangential speed of 58 metres per second, results in a perfect balancing of the disks and other rotating parts, and does away with any cause of disturbing vibrations.

The disks are mounted by pairs on cast-iron frames solidly attached to a cast-iron base (similar to that of a machine tool).

In order to ensure the maximum output, depending on the purity of the ebonite, the disks have been fitted with a patented device allowing them to be withdrawn separately at a moment's notice, so that the machine may be cleaned in a few minutes.

The transmission of driving energy is effected by means of a shaft driven by the motor-belt. On this intermediate shaft are keyed the driving-pulleys of the disks, driven through belt transmission. As the strain on the belts is uniformly distributed, they are all lengthened in the same proportion. In order to tighten the belts, the position of the intermediate shaft is altered by a lever, and it is fixed by tightening a nut on a perforated sector below the bench.

In order to allow for any combination liable to arise in connection with laboratory work, the diametrical conductors are insulated against the bulk of the machine, while being so arranged as to enable their angle to be readily adjusted.

In connection with the first tests of this machine, potential differences of up to 320,000 volts could be obtained, this limit being determined by the sparking set up between the metal frame and the current collectors, that is, over a length slightly exceeding the radius of the disks.

THE MINERS' ELECTRIC LAMP COMPETITION.

As our readers will remember, in May, 1911, the Secretary of State for the Home Department announced a prize of £1,000 for the electric lamp suitable for miners which best fulfilled certain specified requirements. The amount of the prize was placed at the disposal of the Secretary of State by a colliery proprietor, and the object of the competition was to encourage the production of safe and efficient types of electric lamps for miners.

Mr. Charles Rhodes (a former President of the Institute of Mining Engineers), and Mr. Charles H. Merz (a member of the recent Departmental Committee on the Use of Electricity in Mines), consented to act as judges, and the conditions of the competition were as follows :—

1. The competition was open to persons of any nationality.
2. The judges were empowered to award the whole of the prize, or to divide it, or to make no award if no lamp appeared to them to be of sufficient merit.
3. The competition was open for six months, closing on December 31st, 1911.

The requirements which all the lamps submitted in competition were asked to fulfil were as follows :—

1 Each lamp was to be of sound mechanical construction, so as to withstand rough usage.
2. It was to be of simple construction and easy to maintain in good order and repair.
3. It was to be so constructed as to render impossible the ignition of inflammable gas either within or without the lamp.
4. The lamp battery was to be so constructed that any liquid it might contain could not be spilled with the lamp in use.
5. The lamp was to be so constructed as not to be liable to deterioration by corrosion as a result of the action of the electrolyte.
6. It was to be effectively blocked.
7. It was to be capable of giving an amount of light not less than 2 C.P. continuously for 10 hours.
8. The light was to be well distributed outside the lamp.

In addition to the above, regard was directed to be paid to :—(*a*) The first cost of the lamp ; (*b*) the cost of maintenance ; (*c*) convenience in handling ; and (*d*) the weight of the lamp when charged and ready for use.

The judges have now issued their award, which is in the following terms :—

Miners' Electric Safety Lamp Competition.

We have had submitted to us 195 lamps, varying very considerably in design and construction.

We have awarded the first prize to the C.E.A.G. Lamp, sent in by Mr. F. Farber, Beurhausstrasse, 3, Dortmund, Germany, and inasmuch as a number of other lamps possess considerable merits, we have apportioned the amount offered for competition as follows :—

Farber, F., Beurhausstrasse 3, Dortmund, Germany	£600
Attwater, Thos., 22, Pelham Square, Brighton	50
Bohres, Adolf, Zietenstrasse 12, Hanover, Germany	50
Bristol Electric Safety Lamp Works, 40, Gt. Smith Street, Westminster	50
Electrical Co., Ltd., 112-124, Charing Cross Road, London, W.C.	50
Gray, W. E., 19, Archer Street, Camden Town, London, N.W.	50
Joel, H. F., 134B, Kingsland Road, London, N.E.	50
Oldham & Son, Denton, Manchester	50
Tudor Accumulator Co., 119, Victoria Street, Westminster, S.W.	50

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Amendments.

AUSTRALIA.—The Customs authorities have further amended their regulations regarding the qualifications necessary for goods to secure entrance under the preferential tariff. Clause 4 of the existing certificate is amended as follows :—Certificate, Form "A" : That in the calculation of such proportion of British production or British labour none of the following items has been included or considered :—Manufacturer's profit or the profit or remuneration of any trader, agent, broker, or other person dealing in the article in its manufactured finished condition (*costs incurred in the mere packing of foreign-made goods in, e.g., cartons or other containers*) ; cost of outside packages or any cost of packing the goods thereinto ; any cost of conveying, insuring, or shipping the goods subsequent to their manufacture.

[The words given in italics are now deleted.]

NEW ZEALAND.—The Customs authorities have also revised their preferential tariff regulations so that they now conform more or less to the Australian regulations. The most important new stipulation is that before goods can be entered under the preferential tariff their finishing process must have been effected by British labour, in addition to the requirement that 25 per cent. of their total value shall also be produced by British labour. The following are the more important of the new regulations :—

1. The classes of goods which shall be deemed to be the produce or manufacture of the British Dominions for the purposes of the said Act shall be the following :—

(*a*) Goods wholly the produce of the British Dominions.

(*b*) Goods wholly manufactured within the British Dominions from materials produced in such Dominions.

(*c*) Goods wholly manufactured within the British Dominions in which all manufacturing processes are performed in the British Dominions from unmanufactured raw material of foreign origin.

(*d*) Goods partially produced or partially manufactured in the British Dominions, provided that the final process or processes of manufacture have been performed in such Dominions, and also that the expenditure in material produced in such Dominions and [or] labour performed within such Dominions (calculated subject to the qualification hereunder) in each and every article is not less than one-fourth of the factory or works cost of such article in its finished state.

2. In the calculation of such proportion of produce or labour of the British Dominions, none of the following items shall be included or considered : Manufacturer's profit, or the profit or remuneration of any trader, agent, broker or other person dealing in the article in its manufactured finished condition ; costs incurred in the mere packing of foreign-made goods in [*e.g.*, cartons or other containers] ; cost of outside packages or any cost of packing the goods thereinto ; any cost of conveying, insuring or shipping the goods subsequent to their manufacture.

3. Goods landed in transit. Goods which, after shipment from any part of the British Dominions, have entered into the commerce of or been subject to any process of manufacture in any foreign country, shall not be deemed to be the produce or manufacture of the British Dominions.

The following are the new forms of certificates which are to replace those of which copies have already been published in the Electrical Review.

No. 1.

Form of certificate prescribed to be written or printed on invoices of all articles for entry under the Preferential Tariff of New Zealand when made and signed by an individual exporter personally.

I [*Full name of Exporter*], the exporter of the articles included in this invoice amounting to [*Total value of invoice, in words at length*], and dated , of goods supplied to [*Name of purchaser*], do hereby declare that I have the means of knowing and do hereby certify as follows :—

1. That the said invoice is in all respects true and correct :
2. That every article mentioned in the said invoice has been either wholly or partially produced or manufactured in [*Name of*

part of British Dominions], and is *bonâ fide* the produce or manufacture of that part of the British Dominions.

3. As regards those articles only partially produced or manufactured in that part of the British Dominions :—

(*a*) That the final process or processes of manufacture have been performed in that part of the British Dominions.

(*b*) That the expenditure in material produced in the British Dominions and [or] labour performed within such Dominions (calculated subject to the qualifications hereunder) in each and every article is not less than one-fourth of the *factory or works cost* of such article in its finished state.

4. That in the calculation of such proportion of produce or labour of the British Dominions, none of the following items have been included or considered : Manufacturer's profit, or the profit or remuneration of any trader, agent, broker, or other person dealing in the article in its manufactured finished condition ; costs incurred in the mere packing of foreign-made goods in (*e.g.*, cartons or other containers) ; cost of outside packages or any cost of packing the goods thereinto ; any cost of conveying, insuring, or shipping the goods subsequent to their manufacture.

[*Signature.*]

Dated at.....this.....day of.....,19.....

No. 2.

Form of Certificate prescribed to be written or printed on Invoices of all articles for entry under the Preferential Tariff of New Zealand, when made and signed by a person other than an Individual Exporter.

I. [*Full name of person signing the certificate*], [partner, manager, chief clerk *or* principal official, *giving rank, as the case may be*], of [*name and address of exporter or exporters*], the exporter[s] of the articles included in this invoice to [*Total value of invoice, in words at length*] and dated....., of goods supplied to [*name of purchaser*],do hereby declare that I am duly authorised to make and sign this certificate on behalf of the said exporter[s].

I have the means of knowing and I do hereby certify as follows : (then continue as in paragraphs No. 1-4 of Form 1 printed above).

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

18,044. "System of electric signal or control for railway trains." G. Barker (Thomson Automatic Signal Co., U.S.). August 6th. (Complete).

18,060. "Electric couplings or connectors." J. Wilkie. (Addition to 3,772/12). August 6th.

18,065. "Electrometers and appliances for indicating and measuring variations in electric potential, especially in earth potential, and a method of applying the same for meteorological purposes." A. H. Maurice. August 6th.

18,070. "A bottom for miners' pit lamps electrically lighted." D. Morrison. August 6th. (Complete).

18,072. "Electrical attachment for motion picture machines." G. E. Ward. August 6th. (Complete).

18,080. "Electric heated glove." A. L. Carron. (Convention date, September 9th, 1911, United States.) August 6th. (Complete).

18,086. "Receiving apparatus for electric waves." F. Schneider. (Convention date, April 15th, 1912, Germany.) August 6th. (Complete).

18,087. "Cooling dynamo-electric machinery and means therefor." Siemens Bros. Dynamo Works, Ltd., and J. W. Howard. August 6th.

18,094. "Electric locomotives." J. le C. Davis. (Convention date, August 7th, 1911, United States.) August 6th. (Complete.)

18,107. "Compensation of single-phase potential regulators." Akt.-Ges. Brown, Boveri et Cie. (Convention date, August 3rd, 1911, Germany.) August 6th. (Complete.)

18,109. "Circuit breakers." E. C. R. Marks. (Clinton Wire Cloth Co., United States.) August 6th. (Complete.)

18,111. "Wireless telegraph transmitters." A. Shaw. August 6th. (Complete.)

18,115. "Electric dinner or service lifts." F. Hodgson. August 6th. (Complete.)

18,129. "Telephones." H. Sefton-Jones. (Akt.-Ges. Mix & Genest Telephon und Telegraphenwerke, Germany.) August 6th. (Complete.)

18,145. "Brush-holders of electric machinery." W. White, P. Dawson and R. H. Houghton. August 7th.

18,164. "Contacts for electric controllers or switches." G. P. Fairless and S. N. Warren. August 7th.

18,184. "Method of operating electro-magnetic striking tools by means of alternating current. L. Schuler. August 7th. (Complete.)

18,188. "Receiving apparatus for electric waves." F. Schneider. (Addition to 18,086/12.) August 7th. (Complete.)

18,210. "Electric switching devices." F. Coates and A. Reyrolle & Co., Ltd. August 7th.

18,212. "Electrically-operated hot and cold air douches." A. Schaeffer. August 7th. (Complete.)

18,214. "Electrical measuring instruments." E. Fauvin, E. Amiot and E. Cheneaux. (Convention date, September 6th, 1911, France.) August 7th. (Complete.)

18,220. "Electrodes for arc lamps." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) August 7th.

18,262. "Fire-alarm signal-boxes for automatic telephone systems." A. J. Boult. (Denio General Electric Co., United States.) August 8th. (Complete.)

18,275. "Combined plug and switch for electric circuits." W. R. Lambert. August 8th.

18,312. "Magnetic compasses." Kelvin & James White, Ltd., M. B. Field and D. Renfrew. August 9th.

18,341. "Electrodes." H. S. Hatfield and Chamberlain & Hookham, Ltd. August 9th. (Complete.)

18,349. "Ironclad electric switch and distribution boards." H. H. Berry and W. J. Markham. August 9th.

18,356. "Automatic telephone circuits." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) (Addition to No. 27,458, of 1909.) August 9th. (Complete.)

18,368. "Multiplex telegraphic printing apparatus for automatic and manual transmission and of high output also capable of being used with submarine cables." A. Colonna. August 9th. (Complete.)

18,369. "Polarised telegraphic relay." A. Colonna. August 9th.

18,371. "Vapour electric devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) August 9th.

18,372. "Vapour electric devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) August 9th.

18,387. "Time recorder for electric lamps, motors, stoves, radiators, and the like." T. Thorp, F. Thorp and H. T. Thorp. August 10th.

18,404. "Galvanic cell." J. T. Szek and A. Szek. (Convention date, August 12th, 1911, Belgium.) August 10th. (Complete.)

18,412. "Dynamo-electric machines." E. R. Clarke. August 10th.

18,422. "Wireless telegraphy and telephony." J. T. Sibley. August 10th.

18,425. "Generator regulators." W. E. Lake. (J.B.M. Electric Co., United States.) August 10th. (Complete.)

18,430. "Selector for automatic or semi-automatic telephone systems." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) August 10th. (Complete.)

18,437. "Lamp regulators." W. E. Lake. (J.B.M. Electric Co., United States.) August 10th. (Complete.

18,440. "Electromagnetic brakes." A. Thode & Co. (Convention date, August 10th, 1911, Germany.) August 10th. (Complete.)

18,444. "Electrical systems for internal-combustion engines." W. E. Lake. (J.B.M. Electric Co., United States.) August 10th. (Complete.)

18,449. "Electrolytic production of metals." R. W. Wallace and E. Wassmer. August 10th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford ; price, post free, 9d. (in stamps).

1911.

Fittings for Metallic Conduits for enclosing the Cables of Electrical Wiring Systems. L. M. Waterhouse and Simplex Conduits, Ltd. 14,650. June 21st.

Cash-registering Machines and Electrical Control Means for same. National Cash Register Co. (National Cash Register Co.) 16,727. July 26th.

Semi-automatic Telephone Exchange Systems. F. T. McBerty. 17,211. July 27th. (June 27th, 1910.)

Supports for Electrical Conductors. Callender's Cable and Construction Co. and C. W. Kay. 17,294. July 28th.

Illuminated Signs. V. von Vangel. 17,306. July 28th.

Earthing or Bonding Devices for Electric Conductors. W. T. Henley's Telegraph Works Co. and W. F. Bishop. 17,347. July 29th.

Dynamo-Electric Machines. J. W. Greenwood. 17,885. August 5th.

Testing Electric Meters. T. E. Murray. 18,763. August 21st. (October 25th, 1910.)

Apparatus for Winding Armatures. K. R. Ritter. 20,997. September 22nd. (September 23rd, 1910.)

Magneto-Electric Machines for Ignition Purposes. B. Brooks and F. H. Alston. 21,025. September 23rd.

Electrical Plug Switches. J. Y. W. MacAlister. 21,168. September 25th.

Electrodes for Arc Lamps. W. R. Ridings. 21,647. October 2nd.

Magneto Machines. W. H. Moore. 21,755. October 3rd.

Subscriber's Instrument Set for Automatic Telephone Exchanges. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 22,805. October 16th.

Electric Insulators. G. Fuller and G. J. A. Fuller. 23,324. October 23rd.

Supports for Electrical Conductors. Callender's Cable and Construction Co. and C. W. Kay. 23,565. (Divided application on 17,294 of 1911. July 28th.) October 25th.

Means for Suspending Electric Conductors. Callender's Cable and Construction Co. and C. W. Kay. 23,566. (Divided application on 17,294 of 1911. July 28th.) 23,566. October 25th.

Electric Lighting. I. Frankenburg & Sons, Ltd., and E. Fleming. 26,383. November 25th. (Addition to 28,724 of 1910.)

Method of Pointing Wires preparatory to Drawing. Julius Pintsch Akt.-Ges. 27,262. December 5th. (November 20th, 1911.)

1912.

Magnet Electric Speed Indicators. J. Schuster. 1,288. January 16th. (January 17th, 1911.)

Electric Cables for Automatic Telephone Exchange Selectors and the like. Western Electric Co. (Western Electric Co.) 3,920. (Divided application on 16,868 of 1911. July 22nd.) February 16th.

Electrically-heated Ovens. R. Haddan. (Copeman Electric Stove Co.) 5,986. (Divided application on 22,001 of 1911. October 5th.) March 9th.

Manual and Semi-automatic Telephone Exchange Systems. F. R. McBerty. 8,571. April 11th. (July 27th, 1910. Divided application on 17,211 of 1911. July 27th.)

Automatic or Semi-automatic Telephone Exchange Systems. F. R. McBerty. 8,572. April 11th. (July 27th, 1910. Divided application on 17,211 of 1911. July 27th.)

Means for Attaching Wires and Cables to Insulators. H. Parra. 9,520. April 22nd. (May 1st, 1911.)

Device for Automatically Cooling the Atmosphere in Enclosures on the Attainment of a Predetermined Temperature, and for giving an Alarm when the said Temperature is exceeded. J. A. Voigt. 10,951. April 30th.

Receiver for Telegraph Printing Machines. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 13,490. June 8th.

Hinckley Electric Supply.—The Leicestershire and Warickshire Electric Power Co. has applied to the B. of T. for consent to erect overhead lines for the transmission of energy at a pressure of 6,600 volts from Nutt's Lane power station, near Hinckley, to Battling Brook, and thence to Hollycroft Road.